BUTTERFIELD

NO. 23

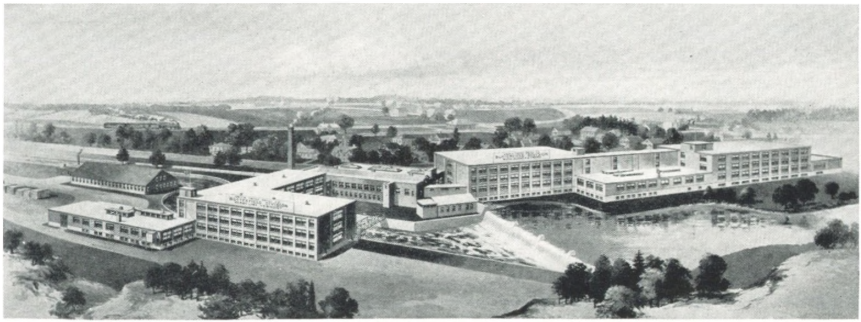
BUTTERFIELD

The Better Tools

UNION TWIST DRILL CO.

BUTTERFIELD DIVISION

CATALOG NO. 23



BUTTERFIELD DIVISIONS

FOUR AND THREE QUARTER ACRES OF FLOOR SPACE

United States Factory, Derby Line, Vermont. Manufacturers of Taps, Dies, Screw Plates, Die Stocks and Dies, Tap Wrenches and Reamers.

Canadian Factory, Rock Island, Quebec. Manufacturers of Twist Drills, Reamers, Milling Cutters, Hobs, Gear Cutters, Taps, Dies, Screw Plates, Tap Wrenches.

UNION TWIST DRILL CO.

BUTTERFIELD DIVISION

Established 1880

Manufacturers of

TAPS, DIES
SCREW PLATES
REAMERS

CATALOG NO. 23

1948

This cancels all previous editions

FACTORIES
DERBY LINE, VERMONT, U. S. A.
ROCK ISLAND, PROVINCE QUEBEC, CANADA

CLEVELAND STORE	2902 Euclid Ave.
NEW YORK STORE	61 Reade Street
CHICAGO STORE	11 South Clinton Street
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LOS ANGELES	524 East 4th Street
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AFFILIATED PLANTS
Athol, Mass. Mansfield, Mass.

Cable Address
"DERBY"

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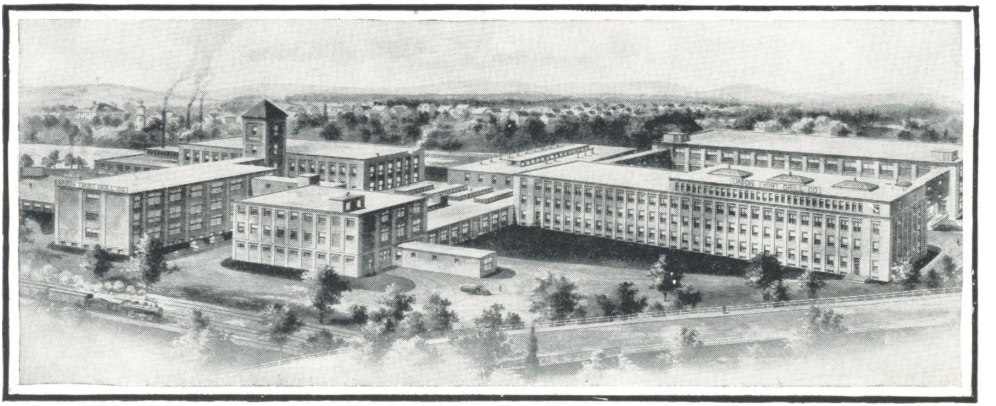


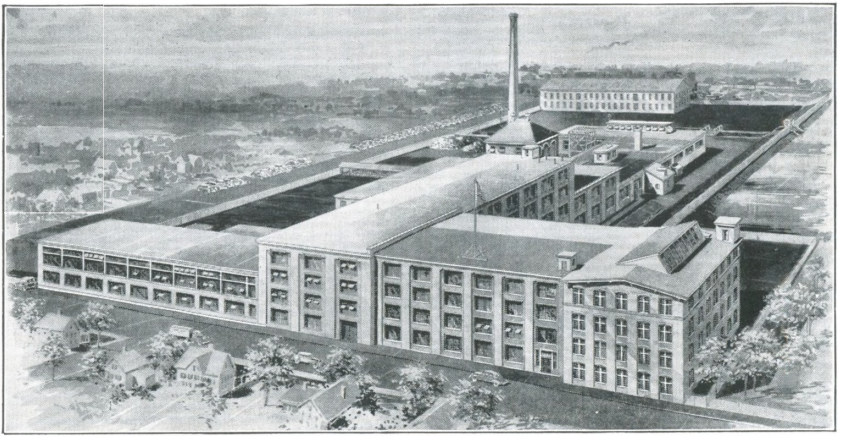
UNION TWIST DRILL COMPANY

Athol, Massachusetts, U. S. A.

EIGHT ACRES OF FLOOR SPACE

The Parent Company

Manufacturers of Drills, Reamers, Cutters and Hobs



S. W. CARD MFG. CO. DIVISION

Mansfield, Massachusetts

THREE ACRES OF FLOOR SPACE

Manufacturers of Taps, Dies, Screw Plates, Die Stocks and Tap Wrenches

Introduction

THE BUTTERFIELD DIVISION OF THE UNION TWIST DRILL CO. was established in the year 1880 for the production of Taps and Dies together with kindred Tools most commonly used by Blacksmiths, Wheelwrights and small Machine Shops. In the year 1890 the business had developed to a point which made the addition of greater facilities necessary and in 1897 the Company was Incorporated, thus bringing in the capital required for new Buildings, new Machinery, etc., now needed to meet the ever increasing demand for the high grade Tools which the Company produced.

Butterfield & Co., as it was known at that time, made such rapid strides between the years 1897 and 1913 that in the latter year it attracted the attention of the Union Twist Drill Co. with the result that the negotiations which followed quickly consolidated the two organizations. Healthy and prosperous growth from 1913 to date has been marked, as all that follows in this catalog clearly indicates.

Modern Screw Threading Practice

We shall not attempt in this catalog to cover the various phases and details of the great advance in Screw Threading Practice made during the past decade. Suffice it to say, however, that complete information bearing on standardization of design, dimensions, tolerances, drill sizes, etc., will be found in the back of this book.

Marking

The many changes in Screw Thread Practice recommended by the National Screw Thread Commission and adopted by the Tap Manufacturers, has occasioned the latter to recognize the necessity of a uniform method of marking Taps and Dies and other threaded tools, and in view of this we have adopted the present standard system of marking covered by Table 301 in the back of this catalog.

Classes and Styles of Taps

Experience accumulated during the past sixty-six years has enabled us to arrange all Standard or Stock Taps into four classes. These four classifications will be explained in greater detail further on, thus simplifying the task confronting the user in his attempt to select the type best suited to his particular needs. We believe that we

have listed in this catalog types and sizes which will in the great majority of instances enable the intelligent user to select stock items and thus avoid the time and expense involved in the production of special tools.

The four classes of taps referred to above are as follows:

Carbon Steel Cut Thread Taps.
High Speed Steel Cut Thread Taps.
High Speed Steel Commercial Ground Thread Taps.
High Speed Steel Precision Ground Thread Taps.

Carbon Steel Cut Thread Taps

All carbon steel cut thread taps are made to N.S.T.C. tolerances, and under normal conditions as to material, cutting speeds, lubrication, machine adjustments, etc., will produce holes within Class 2, Free Fit tolerances. The attention of Tap users however must be directed to the fact that improper or insufficient lubrication—grinding by an unskilled operator which changes the chamfer, clearance or rake in any manner after it leaves our hands, or used in material for which not designed nor suitable, is quite likely to make a tap produce oversize holes, and in some instances, undersize holes.

Needless expense, lost time and spoiled work can be avoided in the great majority of instances if careful attention is given in the first place to the selection of the tap which the nature of the tapping operation to be performed indicates. Add to this, care in keeping the taps sharp and the proper performance of the sharpening operation, and every Butterfield Tap will give long and satisfactory service.

High Speed Steel Cut Thread Taps

These taps are designed for production tapping in tough, stringy material where extreme accuracy is not of particular importance. Being made however to the same dimensions and tolerances as Carbon Steel Cut Thread Taps, they will produce Class 2 Fit holes and will stand much higher tapping speeds. Recommended for use in tough alloy steels where Carbon Tap life would be short.

High Speed Steel Commercial Ground Thread Taps

These taps will be readily identified by the single ring around the shank. As they are held to a pitch diameter tolerance of .001 of an inch and a lead error of not over .0005 in one inch of thread length,

they will produce "Class 2 Fit" tolerances almost indefinitely or until entirely worn out.

Shanks on all Commercial Ground Taps are ground concentric with the thread, and the only difference between them and Precision Ground Taps is in the slightly greater tolerance range on outside and pitch diameters. Tolerances to which these taps are made will be found in the back of the catalog. See Table 326.

Remember that Commercial Ground Taps are recommended for long high speed production runs on "Class 2 Fit" holes in interchangeable parts.

High Speed Steel Precision Ground Thread Taps

Indicated for all tapping operations where extreme accuracy is of paramount importance and tolerances within .0005 of an inch on pitch diameter must be maintained.

These taps like the Commercial Ground Taps are ground all over after the hardening process but are held to the closer tolerance of .0005 on the pitch diameter and are furnished in four distinct Tolerance Classifications: i.e., No. 01, No. 1, No. 2, and No. 3; the range according to classification being from .0005 under basic to .0015 over basic in steps of .0005 of an inch as shown in table 327 in the back of this catalog.

Precision Ground Taps are particularly recommended for Stud Bolt holes, in fact, they will be found especially effective wherever vibration enters into the problem and where lock washers or similar locking devices cannot be used to advantage.

Reamers

The proof of entire satisfaction to the user of Reamers is to be found in the number of accurate, smooth holes which the Reamer will produce from the time it enters the first hole until finally worn out. Our years of experience have enabled us to design and perfect a complete line of both Carbon and High Speed Steel Reamers in every known type and for every requirement which we honestly believe will give the user superior results and that feeling of satisfaction which only the best provides.

In the Reamer Section of this catalog will be found Reamers with both straight and spiral flutes, solid and expanding, taper and parallel

—in fact, for every purpose and every Reamer guaranteed to give entire satisfaction to the user.

Special Taps, Dies and Reamers

Our facilities for the production of special tools to customers' Blueprints, Sketches or Samples cannot be excelled, and the experience and ability of our Engineers is always at the disposal of users desiring or needing expert advice without cost to them.

Because of the innumerable instances where tools of a special nature are required and the great variety of the problems encountered, customers will save much time and correspondence if in the beginning they will send us Blueprints, Sketches or Samples and in addition to this, tell us the material which is to be tapped or reamed and specify the depth of the hole. We should be further advised if the hole is open or blind and if the operation is to be performed by power or by hand.

Please remember that orders for special tools cannot be cancelled, nor can they be returned after receipt by customer without our permission.

General Information

This catalog contains all of the latest data and information available from the National Screw Thread Commission and similar organizations particularly interested in the standardization of the many small tools used in Metal Working industries. The tables to be found in the back of the book will be of special interest to all users of Small Tools and constitute a reliable and valuable source of information which it has cost thousands of dollars to accumulate and compile.

Prices given in this catalog are list prices, subject to discount which will be quoted upon application.

To avoid possible misinterpretation, please use catalog terms and list numbers. Always be sure that your instructions are complete.

Variations from catalog listing in form, size, pitch, etc. must be classed as special and thus become subject to special prices.

We do not assume responsibility for goods lost, damaged or delayed in transit but offer our services to the purchaser in tracing the shipment or facilitating the filing of claims.

All claims for errors or shortages must be filed within three days from receipt of shipments.

Shipping and Transportation

Shipping instructions should be noted on each order. When they are omitted, we will use our best judgment, which must be accepted by the customer.

Domestic Shipments:—F.O.B. Derby Line, Vermont (Transportation allowances explained on Discount Sheets).

Foreign Shipments:—F.O.B. Derby Line, Vermont (Transportation paid to Boston or New York).

Time and transportation cost may be saved many times by addressing orders to our own Stores. (See title page for Store addresses.)

Guarantee

Butterfield Tools—"The Better Tools"—are guaranteed against defects in both material and workmanship, and will be replaced free of cost to customers when returned to us and found to be imperfect or not up to our usual standard in every detail.

New Tools

Since our previous Catalog was published our Engineering Department has been engaged in studying ways and means of improving the quality and accuracy of Tools which have been on the market for years. In addition they have succeeded in developing New Tools which will appeal to every Tool user.

Particular attention is called to

BUTTERFIELD "THRED-RITE" DIES and HOLDERS

and

STUB REAMERS for SCREW MACHINES

A complete description of these new Tools with prices applying will be found in their respective Sections of this Catalog.

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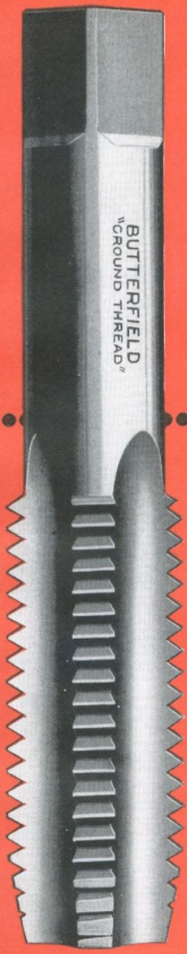
Special Note

When ordering Taper Pipe Taps always specify material in which they are to be used as we make and recommend different types for different materials.

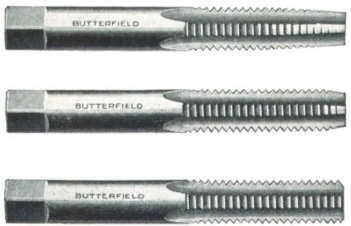


TAPS

SECTION INDEX

No. 1000 Standard Hand Taps

Carbon Steel—Under 1/4 Inch



These taps are furnished with American National or Whitworth form of thread in taper, plug or bottoming style at regular prices.

Sizes and dimensions not listed are special.

Left hand taps are special.

For taps with three flutes not listed below see pages 13 and 18

For standard dimensions and limits see following tables:

Dimensions: Table 302
Limits: Table 325

Sizes and Prices

Diam. of Tap Inches	Price		Threads per Inch		Number of Flutes	Length Over-all Inches
	Each	Per Set	N. S.	Whitworth Std.		
1/16	$0.50	$1.50	64	60	3	1 5/8
3/32	.40	1.20	48	48	3	1 3/4
1/8	.35	1.05	40	40	3	1 15/16
5/32	.35	1.05	32, 36	32	4	2 1/16
3/16	.40	1.20	24, 32	24	4	2 3/8
7/32	.45	1.35	24, 32	24	4	2 3/8

Three Fluted Hand Taps

Carbon Steel

No. 1001 Three Fluted

These taps are furnished with American National form of thread in plug style only at regular prices.

Hand taps to and including 3/8 inch have shanks full diameter of thread. Taps 7/16 inch and larger have shanks smaller than the root diameter of the thread.

Sizes and dimensions not listed are special.

Taper and bottoming taps are special.

Left hand taps are special.

For standard dimensions and limits see following tables:

Dimensions: Table 302
Limits: Table 325

Sizes and Prices

Diam. of Tap Inches	Price Each Three Fluted	Threads per Inch N. C.	Length Over-all Inches
1/4	$0.45	20	2 1/2
5/16	.50	18	2 23/32
3/8	.55	16	2 15/16

No. 1003 Standard Hand Taps

Carbon Steel—¼ Inch and Larger

These taps are furnished with American National or Whitworth form of thread in taper, plug or bottoming style at regular prices.

Hand taps to and including ⅜ inch have shanks full diameter of thread. Taps 7/16 inch and larger have shanks smaller than the root diameter of the thread.

Unless otherwise specified, orders covering special hand taps 1⅛ inch to 1½ inch diameter inclusive, having 14 or more threads per inch, and sizes over 1½ inch diameter with 10 or more threads per inch, will be filled with taps having general dimensions as shown in Table 303.

No. 1003 Standard Hand Taps

Carbon Steel—¼ Inch and Larger

For standard 10, 14 and 18 m/m spark plug taps and other metric taps, see pages 48 to 50.

Sizes and dimensions not listed are special.

Left hand taps are special.

For taps with three flutes see page 13.

For standard dimensions and limits see following tables:

Dimensions: Table 302 Regular
Table 303 Special Fine Pitch
Limits: Table 325

Sizes and Prices

Diam. of Tap Inches	Price		Threads per Inch					Number of Flutes		Length Overall Inches
	Each	Per Set	N.C.	N.F.	N.S.	Whit-worth Std.	Brit. Std. Fine	N.C.—N.S. Whit. & Brit. Std.	N.F.	
¼	$0.45	$1.35	20	28	24, 32	20	26	4	4	2 1/2
5/16	.50	1.50	18	24	32	18	22	4	4	2 23/32
3/8	.55	1.65	16	24	..	16	20	4	4	2 15/16
7/16	.60	1.80	14	20	..	14	18	4	4	3 5/32
1/2	.70	2.10	13	20	..	12	16	4	4	3 3/4
9/16	.80	2.40	12	18	..	12	16	4	4	3 19/32
5/8	.90	2.70	11	18	..	11	14	4	4	3 13/16
11/16	1.05	3.15	..	..	11, 16	11	14	4	4	4 1/32
3/4	1.20	3.60	10	16	..	10	12	4	4	4 1/4
7/8	1.60	4.80	9	14	..	9	11	4	4	4 11/16
1	2.00	6.00	8	14	..	8	10	4	4	5 1/8
1 1/8	2.25	6.75	7	12	..	7	9	4	4	5 7/16
1 1/4	2.60	7.80	7	12	..	7	9	4	6	5 3/4
1 3/8	3.00	9.00	6	12	..	6	8	4	6	6 1/16
1 1/2	3.50	10.50	6	12	..	6	8	4	6	6 3/8
1 5/8	4.20	12.60	..	..	5 1/2	5	..	6	..	6 11/16
1 3/4	5.00	15.00	5	..	..	5	..	6	..	7
1 7/8	5.80	17.40	..	..	5	4 1/2	..	6	..	7 5/16
2	6.70	20.10	4 1/2	..	..	4 1/2	..	6	..	7 5/8

Standard Hand Taps

High Speed Steel 1/4 Inch and Larger

These taps are standard in cut thread, commercial ground or precision ground thread right hand American National form in taper, plug or bottoming style.

Hand taps to and including 3/8 inch have shanks full diameter of thread. Taps 7/16 inch and larger have shanks smaller than the root diameter of the thread.

Hand taps 1 1/8 inch to 1 1/2 inch diameter inclusive, having 14 or more threads per inch, and sizes over 1 1/2 inch diameter with 10 or more threads per inch are made to the dimensions shown in Table 303.

Commercial ground thread taps will be furnished unless precision ground thread are specified. If precision ground thread taps are wanted, specify the limit number.

Standard Hand Taps

High Speed Steel—¼ Inch and Larger

No. 1503 Cut Thread
No. 1500 Commercial Ground Thread
No. 1502 Precision Ground Thread

For standard 14 and 18 m/m spark plug taps and other metric taps, see pages **48 to 50.**

Precision ground thread hand taps not listed in Table 327 are special.

Sizes and dimensions not listed are special.

Left hand taps are special.

For taps with three flutes see page 18.

For standard dimensions and limits see following tables:

Dimensions: Table 302 Regular
Table 303 Special Fine Pitch
Limits: Table 325 Cut Thread
Table 326 Commercial Ground Thread
Table 327 Precision Ground Thread

Sizes and Prices

Diam. of Tap Inches	Price Each		Threads per Inch			No. of Flutes		Length Over-all Inches
	Cut Thread	Ground Thread	N.C.	N.F.	N.S.	N.C. and N.S.	N.F.	
1/4	$0.85	$0.85	20	28	..	4	4	2 1/2
5/16	.95	.95	18	24	..	4	4	2 23/32
3/8	1.10	1.10	16	24	..	4	4	2 15/16
7/16	1.30	1.30	14	20	..	4	4	3 5/32
1/2	1.55	1.55	13	20	..	4	4	3 3/8
9/16	1.85	1.85	12	18	..	4	4	3 19/32
5/8	2.20	2.20	11	18	..	4	4	3 13/16
11/16	2.60	2.60	..	..	11,16	4	4	4 1/32
3/4	3.10	3.10	10	16	..	4	4	4 1/4
7/8	4.30	4.30	9	14	..	4	4	4 11/16
1	5.75	5.75	8	14	..	4	4	5 1/8
1 1/8	7.45	7.45	7	12	..	4	4	5 7/16
1 1/4	9.55	9.55	7	12	..	4	6	5 3/4
1 3/8	11.95	11.95	6	12	..	4	6	6 1/16
1 1/2	14.75	14.75	6	12	..	4	6	6 3/8

Three-Fluted Hand Taps

High Speed Steel

No. 1501—Cut Thread
No. 1508—Commercial Ground Thread
No. 1507—Precision Ground Thread

These taps are standard in cut thread, commercial ground thread, or precision ground thread right hand American National form in plug or bottoming style only.

Hand taps to and including $\frac{3}{8}$ inch have shanks full diameter of thread. Taps $\frac{7}{16}$ inch and larger have shanks smaller than the root diameter of the thread.

Sizes and dimensions not listed are special.

Taper taps are special.

Left hand taps are special.

For standard dimensions and limits see following tables:

Dimensions: Table 302
Limits: Table 325 Cut Thread
Table 326 Commercial Ground Thread
Table 327 Precision Ground Thread

Sizes and Prices

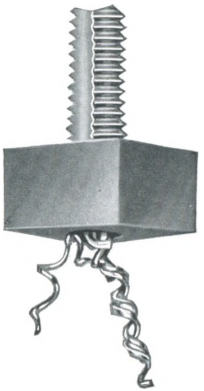
Diam. of Tap Inches	Price Each		Threads per Inch		Length Over-all Inches
	Cut Thread	Ground Thread	N. C.	N. F.	
$\frac{1}{4}$	$0.85	$0.85	20	28	$2\frac{1}{2}$
$\frac{5}{16}$	.95	.95	18	24	$2\frac{23}{32}$
$\frac{3}{8}$	1.10	1.10	16	24	$2\frac{15}{16}$
$\frac{7}{16}$	1.30	1.30	14	20	$3\frac{5}{32}$
$\frac{1}{2}$	1.55	1.55	13	20	$3\frac{3}{8}$

Spiral Pointed Taps

Three Fluted

Spiral pointed taps are designed for tapping deep through holes in all kinds of metals or in blind holes when drilled deeply enough to allow clearance for chips at bottom of hole.

The cutting is done by the first few threads which are milled at an angle to the axis of the tap. This, together with the extreme rake of the straight flutes, produces a long curling chip which is forced ahead of the tap, thus eliminating any chip clogging in the flutes. The cut shows the action of the chips.



The feature of forcing the chips ahead of the tap allows a shallow straight fluting, thereby increasing the strength of the tap and reducing breakage to a minimum.

The taps cut freely, produce excellent threads and have successfully tapped holes where two and sometimes three taps have been required.

When sharpening these taps care should be exercised to maintain the original form of the angular cutting edges. The spiral point should always extend beyond the first full thread.

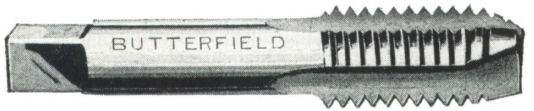
See next page for sizes and prices of spiral pointed hand taps.

Spiral pointed machine screw taps are listed on pages 26 and 27.

Two Fluted

No. 1083 Spiral Pointed Hand Taps

Carbon Steel



These taps are furnished with American National form of thread in plug style only at regular prices.

Spiral pointed hand taps to and including 3/8 inch have shanks full diameter of thread. Taps 7/16 inch and larger have shanks smaller than the root diameter of the thread.

Sizes and dimensions not listed are special.

Taper and bottoming taps are special.

Left hand taps are special.

For standard dimensions and limits see following tables:

Dimensions: Table 302
Limits: Table 325

Sizes and Prices

Diam. of Tap Inches	Price Each	Threads per Inch			Number of Flutes	Length Over-all Inches
		N. C.	N. F.	N. S.		
1/8	$0.45	..	..	40	2	1 15/16
3/16	.50	..	..	24, 32	2	2 3/8
1/4	.55	20	28	..	2	2 1/2
5/16	.60	18	24	..	2	2 23/32
3/8	.70	16	24	..	3	2 15/16
7/16	.75	14	20	..	3	3 5/32
1/2	.85	13	20	..	3	3 3/8

Spiral Pointed Hand Taps

High Speed Steel

No. 1583 Cut Thread
No. 1585 Commercial Ground Thread
No. 1584 Precision Ground Thread

These taps are standard in cut thread, commercial ground thread or precision ground thread right hand American National form in plug style only, except ground thread taps 1/4" and 5/16" diameter which are also standard in bottoming style.

Spiral pointed hand taps to and including 3/8 inch have shanks full diameter of thread. Taps 7/16 inch and larger have shanks smaller than the root diameter of the thread.

Sizes and dimensions not listed are special.

Taper and bottoming taps are special, except as noted above.

Left hand taps are special.

For standard dimensions and limits see following tables:

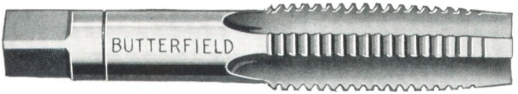
Dimensions: Table 302
Limits: Table 325 Cut Thread
Table 326 Commercial Ground Thread
Table 327 Precision Ground Thread

Sizes and Prices

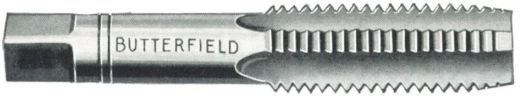
Diam. of Tap Inches	Price Each		Threads per Inch		Number of Flutes	Length Overall Inches
	Cut Thread	Ground Thread	N. C.	N. F.		
1/4	$0.95	$0.95	20	28	2	2 1/2
5/16	1.05	1.05	18	24	2	2 23/32
3/8	1.25	1.25	16	24	3	2 15/16
7/16	1.45	1.45	14	20	3	3 5/32
1/2	1.70	1.70	13	20	3	3 3/8

No. 1006 Serial Hand Taps

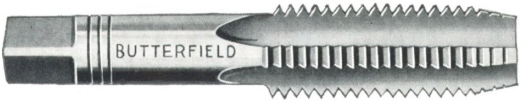
Carbon Steel



No. 1 First Roughing



No. 2 Second Roughing



No. 3 Finishing

These taps are furnished with American National form of thread at regular prices.

Serial hand taps to and including $\frac{3}{8}$ inch have shanks full diameter of thread. Taps $\frac{7}{16}$ inch and larger have shanks smaller than the root diameter of the thread.

Sizes and dimensions not listed are special.

Left hand taps are special.

For standard dimensions see Table 302.

Sizes and Prices

Diam. of Tap Inches	Price		Threads per Inch	Number of Flutes	Length Over-all Inches
	Each	Per Set	N. C.		
$\frac{1}{4}$	$0.45	$1.35	20	4	$2\frac{1}{2}$
$\frac{5}{16}$	.50	1.50	18	4	$2\frac{23}{32}$
$\frac{3}{8}$	.55	1.65	16	4	$2\frac{15}{16}$
$\frac{7}{16}$	.60	1.80	14	4	$3\frac{5}{32}$
$\frac{1}{2}$	.70	2.10	13	4	$3\frac{3}{8}$
$\frac{9}{16}$	.80	2.40	12	4	$3\frac{19}{32}$
$\frac{5}{8}$	.90	2.70	11	4	$3\frac{13}{16}$
$\frac{3}{4}$	1.20	3.60	10	4	$4\frac{1}{4}$
$\frac{7}{8}$	1.60	4.80	9	4	$4\frac{11}{16}$
1	2.00	6.00	8	4	$5\frac{1}{8}$

No. 1024 Stove Bolt Taps

Carbon Steel

These taps are furnished with "Manufacturers Standard" form of thread in plug style only at regular prices.

Sizes and dimensions not listed are special.

Taper and bottoming taps are special.

Left hand taps are special.

For standard dimensions and limits see following tables:

Dimensions: Table 305
Limits: Table 332

Sizes and Prices

Diam. of Tap Inches	Price Each	Threads per Inch	Number of Flutes	Length Overall Inches
3/16	$0.40	24	4	2 3/8
1/4	.45	18	4	2 1/2
5/16	.50	18	4	2 23/32

No. 1027 British Association Taps

Carbon Steel

These taps are furnished with the British Association form of thread in taper, plug or bottoming style at regular prices.

Left hand taps are special.

Sizes and Prices

No.	Price Each	Diam. m/m	Pitch m/m	No.	Price Each	Diam. m/m	Pitch m/m
0	$0.35	6.0	1.00	7	$0.35	2.5	.48
1	.35	5.3	.90	8	.35	2.2	.43
2	.35	4.7	.81	9	.40	1.9	.39
3	.35	4.1	.73	10	.45	1.7	.35
4	.35	3.6	.66	11	.50	1.5	.31
5	.35	3.2	.59	12	.50	1.3	.28
6	.35	2.8	.53	14	.60	1.0	.23

No. 1030 Standard Machine Screw Taps

Carbon Steel

These taps are furnished with American National form of thread and standard number of flutes in taper, plug or bottoming style at regular prices.

When these taps are specified with an optional number of flutes as listed, they will be furnished in plug style only at regular prices.

Sizes and dimensions not listed are special.

Left hand taps are special.

For standard dimensions and limits see following tables:

Dimensions: Table 304
Limits: Table 328

Sizes and Prices

Screw Gauge No.	Basic Major Diam. Inches	Price Each	Threads per Inch			Number of Flutes		Length Over-all Inches
			N. C.	N. F.	N. S.	Standard	Optional	
0	.060	$0.50	..	80	..	2	..	1 5/8
1	.073	.50	64	72	56	2	..	1 11/16
2	.086	.45	56	64	..	3	..	1 3/4
3	.099	.40	48	56	..	3	..	1 13/16
4	.112	.40	40	48	32, 36	3	..	1 7/8
5	.125	.35	40	44	..	3	..	1 15/16
6	.138	.35	32	40	36	3	..	2
8	.164	.35	32	36	40	4	..	2 1/8
8	.164	.35	32	..	..	..	3	2 1/8
10	.190	.40	24	32	30	4	..	2 3/8
10	.190	.40	24	32	..	..	3	2 3/8
12	.216	.45	24	28	32	4	..	2 3/8
14	.242	.45	..	..	20, 24	4	..	2 1/2

Standard Machine Screw Taps

High Speed Steel

No. 1530—Cut Thread
No. 1528—Commercial Ground Thread
No. 1529—Precision Ground Thread

These taps are standard in cut thread or commercial ground thread right hand American National form with standard number of flutes in taper, plug or bottoming style.

Sizes with an optional number of flutes as shown below are standard in plug or bottoming style only.

Precision ground thread taps are furnished in National Coarse and National Fine only. The pitch diameter limits are from basic to basic plus .0005 inch.

Sizes and dimensions not listed are special.

Left hand taps are special.

For standard dimensions and limits see following tables:

Dimensions: Table 304
Limits: Table 328 Cut Thread
Table 329 Commercial Ground Thread

Sizes and Prices

Screw Gauge No.	Basic Major Diam. Inches	Price Each			Threads per Inch			Number of Flutes		Length Over-all Inches
		Cut Thread	Commercial Ground Thread	Precision Ground Thread	N. C.	N. F.	N. S.	Standard	Optional	
0	.060	.....	.....	$2.40	..	80	..	2	..	1 5/8
1	.073	.....	.....	2.20	64	72	..	2	..	1 11/16
2	.086	.....	.....	2.05	56	64	..	3	2	1 3/4
3	.099	$0.85	$0.85	1.50	48	56	..	3	2	1 13/16
4	.112	.70	.70	1.30	40	48	..	3	2	1 7/8
5	.125	.70	.70	1.30	40	44	..	3	2	1 15/16
6	.138	.70	.70	1.30	32	40	..	3	2	2
8	.164	.70	.70	1.30	32	36	..	4	2, 3	2 1/8
10	.190	.75	.75	1.35	24	32	..	4	2, 3	2 3/8
12	.216	.80	.80	1.40	24	28	..	4	..	2 3/8
14	.242	.85	.85	.....	..	..	20, 24	4	..	2 1/2

No. 1032 Spiral Pointed Machine Screw Taps

Carbon Steel

These taps are furnished with American National form of thread in plug style only at regular prices.

Sizes and dimensions not listed are special.

Taper and bottoming taps are special.

Left hand taps are special.

For standard dimensions and limits see following tables:

Dimensions: Table 304

Limits: Table 328

Sizes and Prices

Screw Gauge No.	Basic Major Diam. Inches	Price Each	Threads per Inch			Number of Flutes	Length Over-all Inches
			N. C.	N. F.	N. S.		
3	.099	$0.60	48	56	..	2	1 13/16
4	.112	.50	40	48	36	2	1 7/8
5	.125	.45	40	44	..	2	1 15/16
6	.138	.45	32	40	..	2	2
8	.164	.45	32	36	..	2	2 1/8
10	.190	.50	24	32	..	2	2 3/8
12	.216	.55	24	28	..	2	2 3/8
14	.242	.55	..	..	20, 24	2	2 1/2

Spiral Pointed Machine Screw Taps

High Speed Steel

No. 1532 Cut Thread
No. 1534 Commercial Ground Thread
No. 1549 Precision Ground Thread

These taps are standard in cut thread, commercial ground thread or precision ground thread right hand American National form. Cut thread taps are standard in plug style only while ground thread are standard in both plug or bottoming styles.

Precision ground thread spiral pointed machine screw taps are standard in National Coarse and National Fine thread only with pitch diameter limits from basic to basic plus .0005 inch.

Sizes and dimensions not listed are special.

Taper and bottoming taps are special.

Left hand taps are special.

For standard dimensions and limits see following tables:

Dimensions: Table 304
Limits: Table 328 Cut Thread
Table 329 Commercial Ground Thread

Sizes and Prices

Screw Gauge No.	Basic Major Diam. Inches	Price Each			Threads per Inch			Number of Flutes	Length Overall Inches
		Cut Thread	Commercial Ground Thread	Precision Ground Thread	N. C.	N. F.	N. S.		
3	.099	$0.95	$0.95	$1.60	48	56	..	2	1 13/16
4	.112	.80	.80	1.40	40	48	36	2	1 7/8
5	.125	.80	.80	1.40	40	44	..	2	1 15/16
6	.138	.80	.80	1.40	32	40	..	2	2
8	.164	.80	.80	1.40	32	36	..	2	2 1/8
10	.190	.85	.85	1.45	24	32	..	2	2 3/8
12	.216	.90	.90	1.50	24	28	..	2	2 3/8
14	.242	.95	.95	.....	..	..	20, 24	2	2 1/2

No. 1009 Nut Taps

Carbon Steel

These taps are furnished with American National or Whitworth form of thread at regular prices.

Sizes and dimensions not listed are special.

Left hand taps are special.

For standard dimensions and limits see following tables:

Dimensions: Table 306
Limits: Table 325

Sizes and Prices

Diam. of Tap Inches	Price Each	Threads per Inch			Number of Flutes	Length Over-all Inches
		N. C.	N. F.	Whitworth Std.		
1/4	$0.60	20	28	20	4	5
5/16	.70	18	24	18	4	5 1/2
3/8	.80	16	24	16	4	6
7/16	.90	14	20	14	4	6 1/2
1/2	1.00	13	20	12	4	7
9/16	1.15	12	18	12	4	7 1/2
5/8	1.35	11	18	11	4	8
3/4	1.85	10	16	10	4	9
7/8	2.45	9	14	9	4	10
1	3.15	8	14	8	4	11

No. 1511 Nut Taps

High Speed Steel

These taps are standard in commercial ground thread, right hand American National form.

Sizes and dimensions not listed are special.

Left hand taps are special.

For standard dimensions and limits see following tables:

Dimensions: Table 306
Limits: Table 326 Ground Thread

Sizes and Prices

Diam. of Tap Inches	Price Each		Threads per Inch		Number of Flutes	Length Over-all Inches
	Cut Thread	Ground Thread	N. C.	N. F.		
1/4	$1.50	$1.50	20	28	4	5
5/16	1.70	1.70	18	24	4	5 1/2
3/8	2.00	2.00	16	24	4	6
7/16	2.40	2.40	14	20	4	6 1/2
1/2	2.70	2.70	13	20	4	7
9/16	3.35	3.35	12	18	4	7 1/2
5/8	4.05	4.05	11	18	4	8
3/4	5.65	5.65	10	16	4	9
7/8	7.90	7.90	9	14	4	10
1	10.55	10.55	8	14	4	11

No. 1021 Straight Shank Tapper Taps

Fractional Sizes

Carbon Steel

These taps are furnished with American National or Whitworth form of thread and plain round shanks at regular prices.

When so specified tapper taps will be furnished with any of the following standard shanks at an additional charge based on the quantity ordered.

Squared
Acme Type "C"
National Interchangeable Ring Lock

Sizes and dimensions not listed are special.

Left hand taps are special.

For standard dimensions and limits see following tables:

Dimensions: Tables 307 and 308
Limits: Table 325

Sizes and Prices

Diam. of Tap Inches	Length Overall Price Each		Threads per Inch			Number of Flutes
	12 Inches	15 Inches	N. C.	N. F.	Whitworth Std.	
1/4	$0.75	.....	20	28	20	3
5/16	.85	.....	18	24	18	3
3/8	.95	.....	16	24	16	3
7/16	1.05	.....	14	20	14	3
1/2	1.15	$1.35	13	20	12	3
9/16	1.35	1.55	12	18	12	4
5/8	1.50	1.75	11	18	11	4
3/4	1.95	2.10	10	16	10	4
7/8	2.50	2.75	9	14	9	4
1	3.30	3.65	8	14	8	4
1 1/8	.....	4.15	7	12	7	4
1 1/4	.....	5.10	7	12	7	4
1 3/8	.....	6.00	6	12	6	4
1 1/2	.....	7.35	6	12	6	4

Straight Shank Tapper Taps

Fractional Sizes

High Speed Steel

No. 1523—Commercial Ground Thread

These taps are standard in commercial ground thread right hand American National form with plain round shanks.

The diameter of the shank of standard tapper taps is such that they may be modified to conform to any of the three styles shown in Table 308 as follows:

Squared
Acme, Type "C".
National Interchangeable Ring Lock

Sizes and dimensions not listed are special.
Left hand taps are special.
For dimensions and limits see following tables:

Dimensions: Tables 307 and 308
Limits: Table 326 Ground Thread

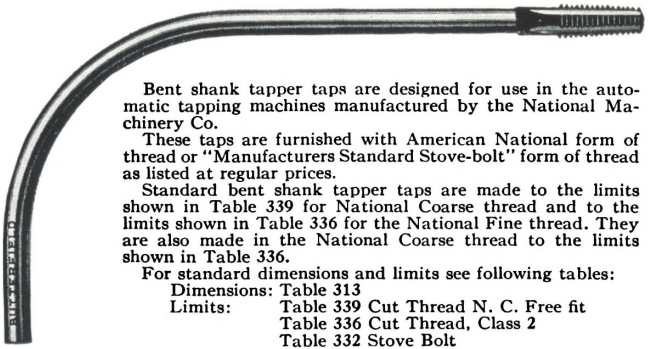
Sizes and Prices

Diam. of Tap Inches	Length Overall Price Each		Threads per Inch		No. of Flutes
	12 Inches	15 Inches			
	Ground Thread	Ground Thread	N. C.	N. F.	
1/4	$3.25	.....	20	28	3
5/16	3.35	.....	18	24	3
3/8	3.80	.....	16	24	3
7/16	4.10	.....	14	20	3
1/2	4.40	$5.30	13	20	3
9/16	5.00	6.20	12	18	4
5/8	5.80	7.00	11	18	4
3/4	7.10	8.60	10	16	4
7/8	9.20	11.15	9	14	4
1	11.30	13.55	8	14	4

No. 1025 Bent Shank Tapper Taps

Fractional Sizes

Carbon Steel



Bent shank tapper taps are designed for use in the automatic tapping machines manufactured by the National Machinery Co.

These taps are furnished with American National form of thread or "Manufacturers Standard Stove-bolt" form of thread as listed at regular prices.

Standard bent shank tapper taps are made to the limits shown in Table 339 for National Coarse thread and to the limits shown in Table 336 for the National Fine thread. They are also made in the National Coarse thread to the limits shown in Table 336.

For standard dimensions and limits see following tables:

Dimensions: Table 313
Limits: Table 339 Cut Thread N. C. Free fit
Table 336 Cut Thread, Class 2
Table 332 Stove Bolt

Sizes and Prices

Diam. of Tap Inches	Size of Machine	Price Each	Threads per Inch			No. of Flutes	Length Overall Inches Before Bending Including Point
			N. C.	N. F.	Stove Bolt Std.		
3/16	3/16"	$0.60	..	..	24	3	4 15/16
1/8	1/4"	.65	40	..	..	3	6 1/2
3/16	1/4"	.65	24	32	24	3	6 1/2
1/4	1/4"	.65	20	28	18	3	6 1/2
5/16	1/4"	.75	18	24	..	3	6 1/2
1/4	3/8"	.70	20	28	..	3	8 3/4
5/16	3/8"	.80	18	24	..	3	8 3/4
3/8	3/8"	.90	16	24	..	3	8 3/4
3/8	1/2"	.95	16	24	..	3	12
7/16	1/2"	1.05	14	20	..	3	12
1/2	1/2"	1.15	13	20	..	3	12
9/16	5/8"	1.55	12	18	..	3	15
5/8	5/8"	1.75	11	18	..	3	15
3/4	5/8"	2.10	*10	16	..	3	15

* Recommended only for thin nuts.

No. 1050 Straight Shank Tapper Taps

Machine Screw Sizes

Carbon Steel

These taps are furnished with American National form of thread and plain round shanks at regular prices.

Sizes and dimensions not listed are special.

Left hand taps are special.

For standard dimensions and limits see following tables:

Dimensions: Table 309
Limits: Table 328

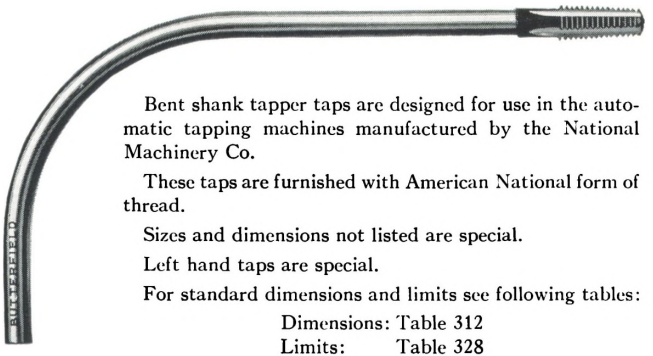
Sizes and Prices

Screw Gauge No.	Basic Major Diam. Inches	Price Each	Threads per Inch			Number of Flutes	Length Over-all Inches
			N. C.	N. F.	N. S.		
4	.112	$0.70	..	..	36	3	6
4	.112	.70	40	..		3	6
4	.112	.70	..	48		3	6
5	.125	.70	40	..		3	8
5	.125	.70	..	44		3	8
6	.138	.70	32	..		3	8
6	.138	.70	..	40		3	8
8	.164	.70	32	..		3	9
8	.164	.70	..	36		3	9
10	.190	.70	24	..		3	11
10	.190	.70	..	32		3	11
12	.216	.70	24	..		3	11
12	.216	.70		28		3	11

No. 1058 Bent Shank Tapper Taps

Machine Screw Sizes

Carbon Steel



Bent shank tapper taps are designed for use in the automatic tapping machines manufactured by the National Machinery Co.

These taps are furnished with American National form of thread.

Sizes and dimensions not listed are special.

Left hand taps are special.

For standard dimensions and limits see following tables:

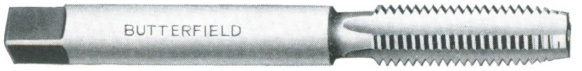
Dimensions: Table 312
Limits: Table 328

Sizes and Prices

Screw Gauge No.	Basic Outside Diam. Inches	Size of Machine	Price Each	Threads per Inch			Number of Flutes	Length Over-all Inches Before Bending Including Point
				N. C.	N. F.	N. S.		
4	.112	1/8"	$0.60	40	48	36	3	3 9/16
5	.125	1/8"	.60	40	44	..	3	3 9/16
6	.138	1/8"	.60	32	40	..	3	3 9/16
6	.138	3/16"	.60	32	40		3	4 15/16
8	.164	3/16"	.60	32	36		3	4 15/16
10	.190	3/16"	.60	24	32		3	4 15/16
12	.216	3/16"	.60	24	28		3	4 15/16
6	.138	1/4"	.65	32	40	..	3	6 1/2
8	.164	1/4"	.65	32	36	..	3	6 1/2
10	.190	1/4"	.65	24	32	..	3	6 1/2
12	.216	1/4"	.65	24	28	..	3	6 1/2
14	.242	1/4"	.65	..	..	20	3	6 1/2
14	.242	1/4"	.65	..	..	24	3	6 1/2

No. 1018 Pulley Taps

Carbon Steel



These taps are furnished with American National form of thread in plug style only at regular prices.
Sizes and dimensions not listed are special.
Taper and bottoming taps are special.
Left hand taps are special.
For standard dimensions and limits see following tables:

Dimensions: Table 310
Limits: Table 325

Sizes and Prices

Size of Tap		Price Each	Threads per Inch N. C.	Number of Flutes	Length of Thread Inches
Diam. Inches	Length Overall Inches				
1/4	6	$0.65	20	4	1
1/4	8	.70	20	4	1
5/16	6	.70	18	4	1 1/8
5/16	8	.75	18	4	1 1/8
3/8	6	.80	16	4	1 1/4
3/8	8	.85	16	4	1 1/4
3/8	10	.90	16	4	1 1/4
7/16	6	.85	14	4	1 7/16
7/16	8	.95	14	4	1 7/16
7/16	10	1.00	14	4	1 7/16
1/2	6	.95	13	4	1 21/32
1/2	8	1.05	13	4	1 21/32
1/2	10	1.10	13	4	1 21/32
1/2	12	1.15	13	4	1 21/32
5/8	6	1.10	11	4	1 13/16
5/8	8	1.35	11	4	1 13/16
5/8	10	1.40	11	4	1 13/16
5/8	12	1.50	11	4	1 13/16
3/4	10	1.85	10	4	2
3/4	12	1.95	10	4	2

Pulley Taps

High Speed Steel

No. 1519 Commercial Ground Thread

These taps are standard in commercial ground thread right hand American National form in plug style only.

For standard dimensions and limits see following tables:

Dimensions: Table 310
Limits: Table 326

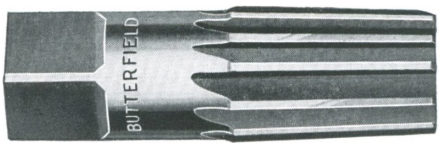
Sizes and Prices

Size of Tap		Price Each		Threads per Inch N. C.	Number of Flutes	Length of Thread Inches
Diam. Inches	Length Overall Inches	Cut Thread	Ground Thread			
1/4	6	$1.70	$1.70	20	4	1
1/4	8	2.25	2.25	20	4	1
5/16	6	1.70	1.70	18	4	1 1/8
5/16	8	2.30	2.30	18	4	1 1/8
3/8	6	2.00	2.00	16	4	1 1/4
3/8	8	2.60	2.60	16	4	1 1/4
3/8	10	3.20	3.20	16	4	1 1/4
7/16	6	2.10	2.10	14	4	1 7/16
7/16	8	2.75	2.75	14	4	1 7/16
7/16	10	3.50	3.50	14	4	1 7/16
1/2	6	2.25	2.25	13	4	1 21/32
1/2	8	3.10	3.10	13	4	1 21/32
1/2	10	3.75	3.75	13	4	1 21/32
1/2	12	4.40	4.40	13	4	1 21/32
5/8	6	2.90	2.90	11	4	1 13/16
5/8	8	4.10	4.10	11	4	1 13/16
5/8	10	5.00	5.00	11	4	1 13/16
5/8	12	5.80	5.80	11	4	1 13/16
3/4	10	6.10	6.10	10	4	2
3/4	12	7.10	7.10	10	4	2

Pipe Reamers

No. 4100 Carbon Steel

No. 4600 High Speed Steel



These reamers are tapered ¾ of an inch to the foot and are intended for reaming holes to be tapped with either American Standard or British Standard taper pipe taps listed on pages 38–39–40.

Sizes and dimensions not listed are special.

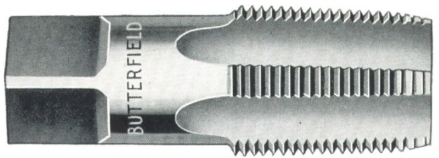
Sizes and Prices

Nominal Size Inches	Price Each		Dimensions—Inches					
	Carbon Steel	High Speed Steel	Diam. Large End	Diam. Small End	Length of Flutes	Diam. of Shank	Size of Square	Length Over-all
⅛	$1.00	$3.50	.362	.316	¾	.4375	.328	2⅛
¼	1.20	4.00	.472	.406	1 1/16	.5625	.421	2 7/16
⅜	1.60	4.25	.606	.540	1 1/16	.7000	.531	2 9/16
½	2.00	5.50	.751	.665	1⅜	.6875	.515	3⅛
¾	2.80	7.50	.962	.876	1⅜	.9063	.679	3¼
1	4.40	11.50	1.212	1.103	1¾	1.1250	.843	3¾
1¼	5.00	19.50	1.553	1.444	1¾	1.3125	.984	4
1½	6.60	25.00	1.793	1.684	1¾	1.5000	1.125	4¼
2	10.00	33.00	2.268	2.159	1¾	1.8750	1.406	4½

Pipe Taps

Carbon Steel

No. 1039-Taper No. 1040-Straight



These taps are furnished with American Standard Pipe or British Standard Pipe form of thread at regular prices.

Unless otherwise specified orders for ⅛ inch pipe taps will be filled with taps having the large shank.

American Standard Form taper pipe taps with right or left hand thread will be furnished at standard list prices but subject to different discounts.

Left hand pipe taps with British Standard thread are special.

Sizes and dimensions not listed are special.

For standard dimensions and limits see following tables:

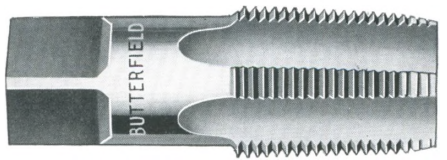
Dimensions: Table 311
Limits: Table 334, 338

Sizes and Prices

Nominal Size Inches	Price Each				Threads per Inch		Number of Flutes		Length Over-all Inches
	American National		British Std.						
	Regular	Straight	Regular	Straight	Amer. Natl.	Brit. Std.	Regular		
⅛	$1.00	$1.00	$1.00	$1.00	27	28	4		2⅛
¼	1.20	1.20	1.20	1.20	18	19	4		2 7/16
⅜	1.60	1.60	1.60	1.60	18	19	4		2 9/16
½	2.00	2.00	2.00	2.00	14	14	4		3⅛
¾	2.80	2.80	2.80	2.80	14	14	5		3¼
1	4.40	4.40	4.40	4.40	11½	11	5		3¾
1¼	5.00	5.00	5.00	5.00	11½	11	5		4
1½	6.60	6.60	6.60	6.60	11½	11	6		4¼
2	10.00	10.00	10.00	10.00	11½	11	6		4½
2½	15.00	....	15.00	....	8	11	8		5½
3	22.50	....	22.50	....	8	11	8		6
3½	30.00	....	30.00	....	8	11	9		6½
4	45.00	....	45.00	....	8	11	9		6¾

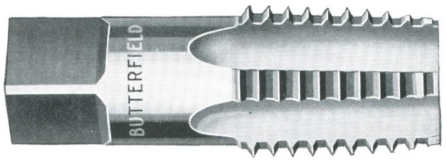
Taper Pipe Taps

High Speed Steel



No. 1539 Cut Thread Taper

No. 1541 Ground Thread Taper



No. 1538 Cut Thread Interrupted

These taps are standard in regular cut thread or ground thread right hand American Standard Pipe form.

⅛ inch pipe taps are standard with either the large or small diameter shank.

Interrupted thread taper pipe taps are standard in cut thread only, right hand American Standard Pipe form.

The first few threads on an interrupted thread pipe tap are left full.

In some cases it is desirable to tap fittings which can be assembled without the use of compound. For this purpose the so-called American Standard Dryseal Pipe Form can be made especially for this work in ground thread taps only. The limits will be found on Table 338, Sheet 2.

Sizes and dimensions not listed are special.

Left hand taps are special.

For standard dimensions and limits see following tables:

Dimensions: Table 311 Limits: Table 338

Sizes and Prices

Nominal Size Inches	Price Each			Threads per Inch	Number of Flutes		Length Overall Inches
	Cut Thread		Ground Thread Regular		Regular	Interrupted	
	Regular	Interrupted					
⅛	$1.60	$2.00	$1.60	27	4	5	2⅛
¼	1.80	2.20	1.80	18	4	5	2 7/16
⅜	2.30	2.80	2.30	18	4	5	2 9/16
½	4.40	5.25	4.40	14	4	5	3⅛
¾	6.10	7.30	6.10	14	5	5	3¼
1	9.20	11.10	9.20	11½	5	5	3¾
1¼	13.10	15.75	13.10	11½	5	5	4
1½	17.70	21.25	17.70	11½	6	7	4¼
2	24.00	28.80	24.00	11½	6	7	4½

Straight Pipe Taps

High Speed Steel

No. 1540 Cut Thread
No. 1542 Commercial Ground Thread
No. 1592 Ground Dryseal

These taps are standard in cut thread or ground thread right hand American Standard Pipe form in plug style only.

⅛ inch pipe taps are standard with either large or small diameter shank.

American Standard Form cut thread straight pipe taps are made from under to over basic, as shown in Table 334, to permit a taper pipe gage to enter up to the notch. Therefore, a basic straight pipe gage will not always enter a threaded hole tapped with a cut thread straight pipe tap.

Ground thread taps right hand American Standard Dryseal Pipe form are also standard from ⅛″ to ½″ inclusive in plug style only.

Sizes and dimensions not listed are special.

Left hand taps are special.

For standard dimensions and limits see following tables:

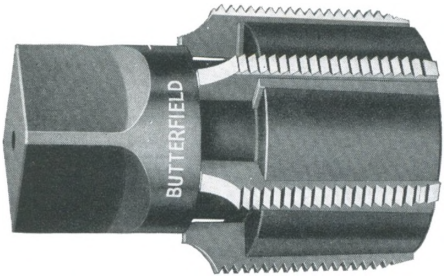
Dimensions: Table 311
Limits: Table 334 Cut Thread
Table 335 Ground Thread

Sizes and Prices

Nominal Size Inches	Price Each		Threads per Inch	Number of Flutes	Length Overall Inches
	Cut Thread	Ground Thread			
⅛	$1.60	$1.60	27	4	2⅛
¼	1.80	1.80	18	4	2 7/16
⅜	2.30	2.30	18	4	2 9/16
½	4.40	4.40	14	4	3⅛
¾	6.10	6.10	14	5	3¼
1	9.20	9.20	11½	5	3¾

Inserted Chaser Taper Pipe Taps

Carbon Steel No. 1061 **High Speed Steel No. 1561**



These taps complete with chasers are standard in cut thread, right hand American Standard Pipe form.

Chasers only are standard in sets cut thread, right hand American Standard Pipe form.

Sizes and dimensions not listed are special.

Left hand taps are special.

Sizes and Prices

Nominal Size Inches	Price of Complete Tap Cut Thread		Threads Per Inch	Length Thread Inches	Length Overall Inches	Number of Chasers to a Set	Price of Chasers per Set Cut Thread	
	Carbon Steel	High Speed Steel					Carbon Steel	High Speed Steel
1½	$20.00	$26.00	11½	2⅛	4¼	4	$6.00	$12.00
2	20.00	26.00	11½	2⅛	4¼	4	6.00	12.00
2½	23.00	32.00	8	2½	5	6	9.00	18.00
3	30.00	40.00	8	2½	5	6	10.00	20.00
3½	40.00	50.00	8	2⅝	5½	6	10.00	20.00
4	50.00	60.00	8	2⅝	5½	6	10.00	20.00
5	75.00	90.00	8	2¾	6	8	15.00	30.00
6	95.00	110.00	8	2¾	6½	8	15.00	30.00

In ordering specify material to be tapped.

Staybolt Taps

Features of Interest in the Manufacture of Staybolt Taps

Design

Taps are fluted sufficient depth and with the right circle of undercut to the threaded sections to give a shearing effect to the cut and eliminate any chip clogging.

The taper threads are cut below the root to eliminate reaming and both taper and straight threads are properly relieved.

The points are chamfered and will readily enter the second sheet.

Steel

A special analysis steel is used in the manufacture of staybolt taps that will stand hard motor driving and reduce breakage to a minimum.

Heat Treatment

In the heat treatment of staybolt taps great care is exercised to hold to close tolerances in size and lead. The depth of temper provides a soft center or core in the tap, adding greatly to the strength and efficiency of the tool.

Detailed specifications and list prices on next page.

No. 1033 Staybolt Taps

Carbon Steel

These taps are furnished with American National or V form of thread at regular prices.

American National form of thread furnished unless otherwise specified.

Sizes and dimensions not listed are special.

Left hand taps are special.

For standard dimensions and limits see following tables:

Dimensions: Table 314
Limits: Table 333

Sizes and Prices

Diam. of Tap Inches	Price Each		Threads per Inch	Number of Flutes
	Of Tap 24" Long	Of Tap 27" Long		
7/8	$10.80	$12.15	12	5
15/16	12.00	13.50	12	5
1	13.20	14.85	12	5
1 1/16	14.40	16.20	12	5
1 1/8	15.60	17.55	12	5
1 3/16	16.80	18.90	12	5
1 1/4	18.00	20.25	12	5
1 5/16	19.20	21.60	12	5
1 3/8	20.40	22.95	12	5
1 7/16	21.60	24.30	12	5
1 1/2	22.80	25.65	12	5

No. 1533 Staybolt Taps

High Speed Steel

These taps are furnished with American National or V form of thread at regular prices.

American National form of thread furnished unless otherwise specified.

Sizes and dimensions not listed are special.

Left hand taps are special.

Ground thread taps are special, however we recommend them because of their cutting qualities and close tolerances in size and lead.

For standard dimensions and limits see following tables:

Dimensions: Table 314
Limits: Table 333

Sizes and Prices

Diam. of Tap Inches	Price Each of Tap 24" Long Cut Thread	Threads per Inch	Number of Flutes
7/8	$20.00	12	5
15/16	20.00	12	5
1	20.00	12	5
1 1/16	20.00	12	5
1 1/8	22.00	12	5
1 3/16	24.00	12	5
1 1/4	26.00	12	5

No. 1036 Spindle Staybolt Taps

Carbon Steel

These taps are furnished with American National or V form of thread at regular prices.

American National form of thread furnished unless otherwise specified.

Sizes and dimensions not listed are special.

Left hand taps are special.

Standard spindle staybolt taps have the following dimensions:

Length of Fluted Thread	4″
Length of Unfluted Thread	6″
Length of Square	1″
Length Overall	12″
Diameter of Spindle	3/8″
Length of Spindle	15 3/8″

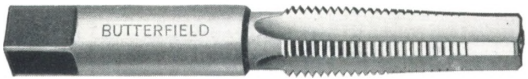
For standard limits see Table 333.

Sizes and Prices

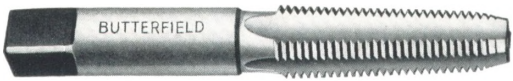
Diam. of Tap Inches	Price Each	Threads per Inch	Number of Flutes	Dimensions—Inches	
				Diam. of Shank	Size of Square
7/8	$13.20	12	5	1.000	3/4
15/16	13.80	12	5	1.000	3/4
1	14.40	12	5	1.000	3/4
1 1/16	15.00	12	5	1.000	3/4
1 1/8	15.60	12	5	1.000	3/4
1 3/16	16.20	12	5	1.062	3/4
1 1/4	16.80	12	5	1.125	3/4
1 5/16	17.40	12	5	1.187	3/4
1 3/8	18.00	12	5	1.250	1
1 7/16	18.60	12	5	1.312	1
1 1/2	19.20	12	5	1.375	1

Straight and Taper Boiler Taps

Carbon Steel



Straight Boiler Taps, No. 1052



Taper Boiler Taps, No. 1051

These taps are furnished with American National or V form thread at regular prices.

American National form of thread furnished unless otherwise specified.

Taper boiler taps have a taper of 3/4 inch to the foot and the diameter is measured 5/8 inch from the large end of the thread.

Sizes and dimensions not listed are special.

Left hand taps are special.

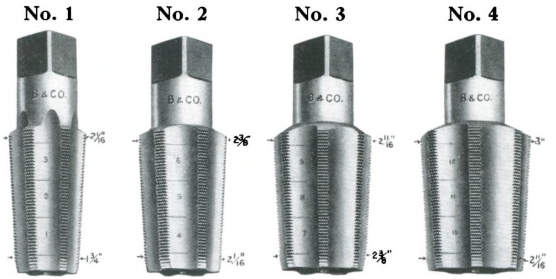
For standard limits on straight boiler taps see Table 333.

Sizes and Prices

Diam. of Tap Inches	Price Each	Threads per Inch	Number of Flutes	Dimensions—Inches				
				Diam. of Shank	Size of Square	Length of Thread Straight	Length of Thread Taper	Length Over-all
1/2	$1.05	12	4	.5000	.375	2	2 1/4	4 1/4
9/16	1.25	12	4	.5625	.421	2 1/8	2 3/8	4 5/8
5/8	1.40	12	4	.6250	.468	2 1/4	2 1/2	5
11/16	1.60	12	4	.6875	.515	2 3/8	2 5/8	5 1/4
3/4	1.95	12	4	.7500	.562	2 1/2	2 3/4	5 1/2
13/16	2.25	12	4	.8125	.609	2 11/16	2 3/4	5 3/4
7/8	2.50	12	4	.8750	.656	2 7/8	2 3/4	6
15/16	2.80	12	4	.9375	.702	3	2 3/4	6 1/4
1	3.35	12	4	1.0000	.750	3 3/16	2 3/4	6 1/2
1 1/16	3.50	12	4	1.0625	.796	3 3/8	2 3/4	6 3/4
1 1/8	3.65	12	4	1.1250	.843	3 7/16	2 3/4	6 7/8
1 3/16	3.85	12	4	1.1875	.890	3 1/2	2 3/4	7
1 1/4	4.05	12	6	1.2500	.937	3 9/16	2 13/16	7 1/8
1 5/16	4.35	12	6	1.3125	.984	3 5/8	2 7/8	7 1/4
1 3/8	4.70	12	6	1.3750	1.031	3 3/4	2 15/16	7 3/8
1 7/16	5.30	12	6	1.4375	1.078	3 7/8	3	7 1/2
1 1/2	5.50	12	6	1.5000	1.125	4	3	7 5/8

No. 1054 Mud or Washout Taps

Carbon Steel



These taps are furnished with American National or V form of thread at regular prices.

American National form of thread furnished unless otherwise specified.

Mud or Washout taps are regularly furnished with a taper of 1¼ inches to the foot and are marked to correspond with taper plugs bearing the same numbers.

Sizes and dimensions not listed are special.

Left hand taps are special.

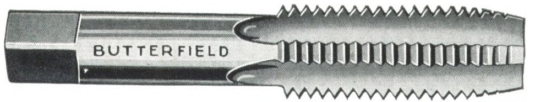
Sizes and Prices

Number	Price Each	Threads per Inch	Number of Flutes	Diam. Inches		Dimensions—Inches			
				Small End	Large End	Diam. of Shank	Size of Square	Length of Thread	Length Over-all
1	$7.60	12	6	1 ¾	2 1/16	2	1½	3⅝	6½
2	9.50	12	6	2 1/16	2 ⅜	2	1½	3⅝	6½
3	12.50	12	8	2 ⅜	2 11/16	2	1½	3⅝	6½
4	14.45	12	8	2 11/16	3	2	1½	3⅝	6½
5	18.35	12	8	3	3 5/16	3	1⅞	3⅝	6½

No. 1003 Hand Taps

Metric Sizes

Carbon Steel



These taps are furnished with the French or International form of thread in taper, plug or bottoming style at regular prices.

French Standard pitches, in sizes 2 m/m to 5.5 m/m inclusive, are those adopted by the French Navy, Department of War, Railway Companies, etc., and approved by the Society for the Advancement of National Industries.

International Standard pitches are the German extension of the Standard International System (S. I.) by the Deutsche Industry-Normen.

Taps to and including 8 m/m have shanks full diameter of thread.

Taps 9 m/m and larger have shanks smaller than root diameter of thread.

Sizes and dimensions not listed are special.

Left hand taps are special.

Sizes and Prices

Diam. of Tap m/m	Price		Pitch m/m			Dimensions—Inches			
	Each	Per Set	French Std.	International Std. (D.I.N.)	Also Furnished	Diam. of Shank	Size of Square	Length of Thread	Length Over-all
1.5	$0.50	$1.50	.35	...	...	.141	.110	5/16	1 5/8
2	.45	1.35	.45	.40	.50	.141	.110	7/16	1 3/4
2.3	.40	1.20	...	.40	...	.141	.110	1/2	1 13/16
2.5	.40	1.20	.45	...	...	.141	.110	1/2	1 13/16
2.6	.40	1.20	...	.45	...	.141	.110	9/16	1 7/8
3	.40	1.20	.60	.50	.75	.141	.110	5/8	1 15/16
3.5	.35	1.05	.60	.60	...	.141	.110	11/16	2
4	.35	1.05	.75	.70	...	.168	.131	3/4	2 1/8
4.5	.35	1.05	.75	.75	...	.194	.152	7/8	2 3/8
5	.40	1.20	.90	.80	.75, 1.00	.220	.165	15/16	2 3/8
5.5	.40	1.20	.90	.90	.75	.220	.165	15/16	2 3/8

No. 1003 Hand Taps

Metric Sizes

Carbon Steel

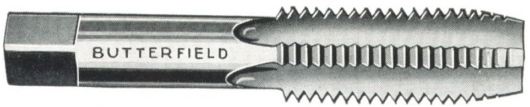
Diam. of Tap m/m	Price		Pitch m/m			Dimensions—Inches			
	Each	Per Set	French Std.	International Std. (D.I.N.)	Also Furnished	Diam. of Shank	Size of Square	Length of Thread	Length Overall
6	$0.45	$1.35	1.00	1.00	1.25	.255	.191	1	2 1/2
7	.45	1.35	1.00	1.00	1.25	.318	.238	1 1/8	2 23/32
8	.50	1.50	1.00	1.25	....	.318	.238	1 1/8	2 23/32
9	.55	1.65	1.00	1.25	....	.275	.206	1 1/4	2 15/16
*10	.55	1.65	1.50	1.50	1.00,1.25	.306	.229	1 1/4	2 15/16
11	.60	1.80	....	1.50	....	.323	.242	1 7/16	3 1/32
12	.70	2.10	1.50	1.75	1.25	.367	.275	1 21/32	3 3/16
13	.70	2.10	....	....	1.50,1.75 2.00	.367	.275	1 21/32	3 3/8
*14	.80	2.40	2.00	2.00	1.25,1.75	.429	.322	1 21/32	3 19/32
15	.80	2.40	....	....	1.75,2.00	.480	.360	1 13/16	3 13/16
16	.90	2.70	2.00	2.00	....	.480	.360	1 13/16	3 13/16
17	1.05	3.15	....	....	2.00	.542	.406	1 13/16	4 1/32
*18	1.05	3.15	2.50	2.50	1.50,2.00	.542	.406	1 13/16	4 1/32
19	1.20	3.60	....	....	2.50	.590	.442	2	4 1/4
20	1.40	4.20	2.50	2.50	2.00	.652	.489	2	4 15/32
22	1.60	4.80	2.50	2.50	....	.697	.523	2 7/32	4 11/16
24	1.80	5.40	3.00	3.00	....	.760	.570	2 7/32	4 29/32
26	2.00	6.00	3.00	....	....	.800	.600	2 1/2	5 1/8
27	2.25	6.75	....	3.00	....	.896	.672	2 9/16	5 5/16
28	2.25	6.75	3.00	....	....	.896	.672	2 9/16	5 7/16
30	2.60	7.80	3.50	3.50	....	.959	.719	2 9/16	5 7/16
32	2.60	7.80	3.50	....	....	1.021	.766	2 9/16	5 3/4
33	3.00	9.00	....	3.50	....	1.108	.831	3	6 1/16
34	3.00	9.00	3.50	....	....	1.108	.831	3	6 1/16
36	3.50	10.50	4.00	4.00	....	1.171	.878	3	6 1/16
38	3.50	10.50	4.00	....	....	1.233	.925	3	6 3/8
39	4.20	12.60	....	4.00	....	1.305	.979	3 5/16	6 11/16
40	4.20	12.60	4.00	....	....	1.305	.979	3 5/16	6 11/16
42	4.20	12.60	4.50	4.50	....	1.305	.979	3 5/16	6 11/16
44	5.00	15.00	4.50	....	....	1 430	1.072	3 5/16	7
45	5.00	15.00	....	4.50	....	1.430	1.072	3 5/16	7
46	5.80	17.40	4.50	....	....	1.519	1.139	3 5/16	7 5/16
48	5.80	17.40	5.00	5.00	....	1.519	1.139	3 5/16	7 5/16
50	6.70	20.10	5.00	....	....	1.644	1.233	3 5/16	7 5/8

*Spark Plug Taps 10 m/m—1.00 m/m pitch, 14 m/m—1.25 m/m pitch and 18 m/m—1.50 m/m pitch are made to the pitch diameter limits shown on Page 50.

No. 1503 Hand Taps

Metric Sizes

High Speed Steel



These taps are standard in cut or ground thread, right hand French or International form in taper, plug or bottoming style.

Sizes and dimensions not listed are special.

Left hand taps are special.

For limits see tables below.

Sizes and Prices

Diam. of Tap m/m	Price Each		Pitch m/m	Dimensions—Inches			
	Cut Thread	Ground Thread		Diam. of Shank	Size of Square	Length of Thread	Length Over-all
10	$1.10	$1.10	1.00	.306	.229	1 1/4	2 15/16
14	1.85	1.85	1.25	.429	.322	1 21/32	3 19/32
18	3.10	3.10	1.50	.542	.406	1 13/16	4 1/32

Cut Thread Limits

Diam. m/m	Pitch m/m	Major Diameter			Pitch Diameter		
		Basic	Mini-mum	Maxi-mum	Basic	Mini-mum	Maxi-mum
10	1.00	.3937	.3965	.3995	.3681	.3686	.3706
14	1.25	.5512	.5544	.5574	.5192	.5197	.5217
18	1.50	.7087	.7126	.7166	.6703	.6708	.6733

Ground Thread Limits

Diam. m/m	Pitch m/m	Major Diameter			Pitch Diameter		
		Basic	Mini-mum	Maxi-mum	Basic	Mini-mum	Maxi-mum
10	1.00	.3937	.3967	.3977	.3681	.3686	.3696
14	1.25	.5512	.5550	.5560	.5192	.5202	.5212
18	1.50	.7087	.7135	.7145	.6703	.6713	.6723

No. 3850 Butterfield Tap Wrenches

These tap wrenches are light but very strong. The jaws are made of tool steel correctly tempered to give long service. A complete range of sizes to meet your requirements.

Number	Length Inches	Holding Taps	Complete Price Each	Extra Jaws Price per Pair
0	5	1/16 to 3/16	$ 1.50	$0.50
8	7	1/16 to 1/4	2.00	.60
9	10 1/2	3/16 to 1/2	3.50	.75
10	15	1/4 to 3/4	4.00	1.25
11	20	3/8 to 1	5.00	1.50
12	25	1/2 to 1 1/4	8.00	2.00
14	30	5/8 to 1 1/2	12.00	2.50

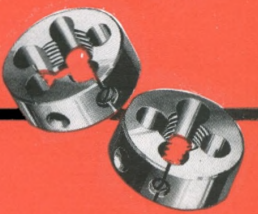
BUTTERFIELD

"THE

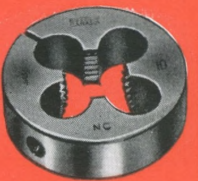
BETTER

TOOLS"

DIES



SECTION INDEX



Foreword

THRED-RITE, is more than a name, it is an achievement in tool engineering and modern manufacturing. It represents the adjustable collet die at its best.

Unfortunately, developments toward improvements and refinement of this type of tool to meet the increasing demand for a screw-thread cutting die that would match modern high speed machine tool equipment, have long been deferred and it has frequently been forced to surrender its most enviable position.

With a background of many years of screw cutting die manufacturing, Butterfield engineers studied not only the requirements of such dies in operation in modern high speed equipment, but also studied the trend of screwthread application; their importance in assembly of intricate machinery; the demand for greater accuracy; closer limits; continuous duplication of the several important thread dimensions to facilitate both security of assembly, as well as economy through random assembly of mating parts.

With completion of their research, Butterfield engineers accepted the assignment to meet the demand of producer and user of screw-threads, for a modernized adjustable collet die, and THRED-RITE dies and holders are the answer.

To accomplish the aforegoing, neither efforts nor expense have been spared to provide a die department specialized in every detail of production, inspection and testing. Steels used in both die and holder are the results of careful selection, tireless experiments in heat treating and endurance tests of the resulting products, under the most severe conditions.

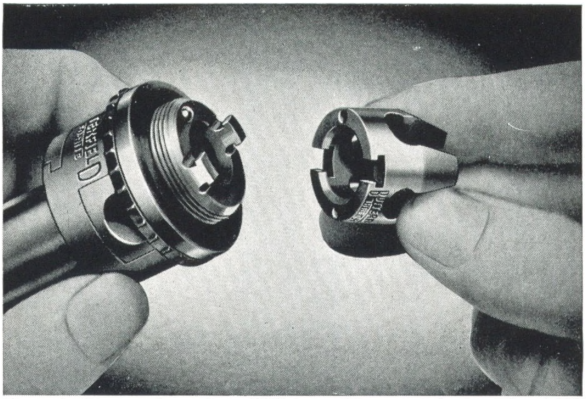
Therefore, it is with a considerable amount of pride that we announce and offer to the producers of quality screwthreads, our Butterfield Line of THRED-RITE dies and holders.

A COMPLETE STOCK of all standard sizes in both National Coarse and Fine threads series are fast being made available for immediate shipment from factory, branch stores and jobbers in all principal cities. In addition, a trained staff of sales and service engineers are available by calling your nearest Butterfield branch office or through any authorized Butterfield jobber.

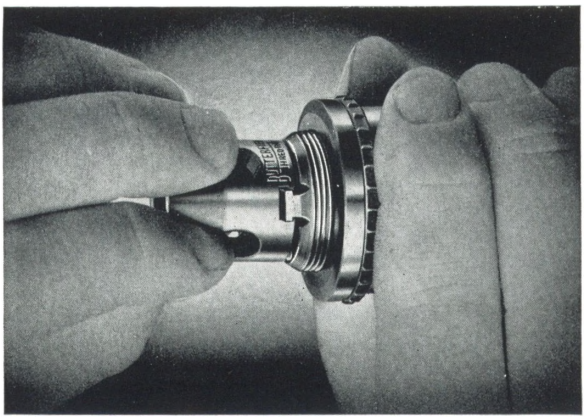
Butterfield
Thred-Rite Dies

DIE ASSEMBLY

An adjustable collet die assembly consists of three primary parts, i.e. the body with its seat for the die and driving lugs, the die itself, and the adjusting cap. While additional parts and features lend themselves materially to greater flexibility and adaptability, the success of the die's performance rests within these three.



Through the use of a unique "T" assembly, an exclusive Thred-RITE feature, proper assembly of driving members is assured by prealignment of the die and holder before the adjusting cap is screwed into place, such an assembly requiring no skill but simply to snap the die into place, as below.



Assembly having been accomplished, the die is fully secured against dropping off, leaving the operator two free hands for adjusting or other manipulation of spindle or turret.

Due consideration has been given to ample float in the assembly of driving lug and seat and with the die seat on the holder carefully ground at right angles with the true center of the adjusting cap, a most desirable condition is provided whereby all die lands are uniformly in contact with the ground taper hole in the adjusting cap. Obviously, this insures uniform adjustment, thereby maintaining at all times the true center of the die.

GRADUATED LOCK NUT

To eliminate further factors of chance, the THRED-RITE die holder has been provided with a micrometer graduated lock nut which is so designed that it will assume a stationary position until the outer ring is revolved in either direction. The outer ring of the lock nut is graduated in .001" with the spread of the spacings providing for further sub-division. When setting up for a new job, it is only necessary to assemble the die with the die seat lugs, and with the test stud in place, screw on the adjusting cap and adjust until the test stud can barely be backed out with the fingers. After removing the test stud, bring the lock nut in contact with the back face of the cap and then tighten cap to set lock.

Now run the first piece and try the gauge and whatever the amount, plus or minus, is required to make the die produce screws with the proper limit, it is only necessary to loosen adjusting cap, rotate the graduated ring on the lock nut, the required number of graduations and then bring the adjusting cap home against the lock nut.

When removing the die for sharpening it is only necessary to back away the adjusting cap leaving the lock nut undisturbed. When the die is again replaced, it remains only to bring the adjusting cap back against the lock nut which has remained in place to secure the setup.

FLUTE SHAPE

Irrespective of claims to the contrary, painstaking study of practically all types of dies has amplified the importance of land contour with relation to free cutting and smooth threads. While the importance of proper rake angle is readily conceded, the importance of the contour of the heel of the die land plays an equally important role where smooth full depth threads are desired. Butterfield has incorporated into THRED-RITE flute design the values resulting from this study.

THRED-RITE flute shape is based on providing for the greatest possible cross section area of the prongs without jeopardizing chip space and lubrication accessibility. The contour of the lands at the heel is designed to break off or crush the unfinished chip at the end of the cut.

GROUND CUTTING FACE

All THRED-RITE dies are machine ground on the cutting face with the desired rake for the material to be threaded. Not only are the lands carefully indexed while being ground but the dies are compressed to basic cutting size during this operation.

CHAMFER

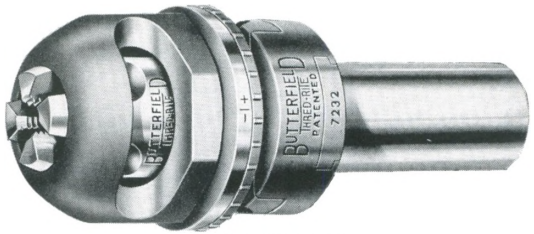
Like cutting face, so also chamfer. Here again Butterfield applies the only means of providing uniform chamfer to produce quality screwthreads with increased die life.

All THRED-RITE dies are chamfered in specialized equipment in which the dies are compressed to basic cutting size. In this position they are ground with proper angle and relief to meet any specific requirement. This process distributes the cutting load uniformly over all lands, providing an equal amount of relief for each chamfered portion. All THRED-RITE dies, regardless of cutting size are so chamfered.

INSPECTION

The final yardstick for checking the accuracy of the finished die and appraise its cutting qualities and serviceability is the "Load test" given all THRED-RITE dies before being released by final inspection. During this test the die is caused to produce specimens of screwthread in material for which it was designed. Butterfield has established a "standard of load" required to die-cut threads in specific material and all THRED-RITE dies are expected to meet a rating based on this standard. More than this, the specimens are carefully measured for lead, form of thread and size and the specimen accompanying each die is the last one cut in *that* particular die and may be used as a setup plug if the user chooses.

Thred-Rite Dieholders



PATENT PENDING

Since the results of an adjustable collet die depends to a considerable degree upon the type and design of the dieholder in which it is housed, special efforts have been made to provide holders comparable to the THRED-RITE die. While the holder is thoroughly floating, it is so designed that it automatically centralizes itself upon backing off the work. All parts are treated to resist wear and are held to interchangeable limits insuring the original fit of any replacement parts.

The adjusting caps are octagon in design. Ample provisions for chip escape and accessibility of lubricant have been provided. The conical bore is true with the threads, has been treated against undue wear and ground to a high finish.

THRED-RITE dieholders are made in both plain floating and releasing types, and both merit the die user's serious consideration. The releasing type is especially adapted for turret lathe work although it may also be used on automatics where threading mechanism permits. This type of holder is particularly recommended for close shoulder work.

Sharpening
Thred-Rite Dies

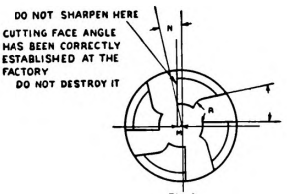


Fig. 1

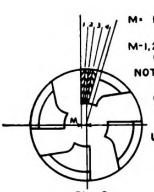


Fig. 2

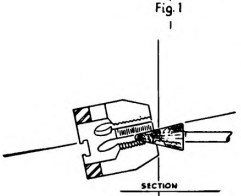


Fig. 4

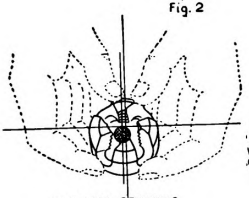


Fig. 3

During the process of manufacturing, the proper cutting rake for the material the die is intended to cut has been established. This cannot be accomplished through hand grinding the cutting faces.

Figure No. 1 — Illustrates the theoretical relation of the cutting face to the center line in a new die.

Figure No. 2 — Shows the change in this line with each grinding.

The proper place to sharpen an adjustable collet die is at the chamfer, for here is where the cutting edges finally break down through wear.

The user should touch up the chamfer at reasonable intervals rather than permit the die to operate until the cutting edges have broken down through fatigue.

Figures No. 3 and No. 4 — Shows the simplicity of sharpening the chamfers.

No. 7000 Thred-Rite Dies

Carbon Steel

Dies with National Coarse Thread Pitches furnished unless otherwise specified.

Dies for threading larger fractional sizes and for 2-inch pipe can be supplied. Prices on application.

All left-hand dies are special.

Orders must designate the following:

A — Cutting size and pitch.
B — Number of die blank.
C — Kind of metal to be threaded.
D — If die is to cut close to shoulder.

Machine Screw Sizes

Sizes and Prices No. 0 Blank 3/8" Outside Diameter

Screw Gage Number	Threads per Inch			Price Each
	NC	NF	NS	Carbon Steel
0	..	80	..	$3.75
1	64	72	56	3.25
2	56	64	..	3.25
3	48	56	..	3.25
4	40	48	36	3.25
5	40	44	..	3.25

Sizes and Prices No. 1 Blank 5/8" Outside Diameter

0	..	80	..	$3.75
1	64	72	56	3.25
2	56	64	..	3.25
3	48	56	..	3.25
4	40	48	36	3.25
5	40	44	36	3.25
6	32	40	36	3.25
8	32	36	40	3.25
10	24	32	30	3.25
12	24	28	..	3.25
14	..	..	20, 24	3.25

Sizes and Prices No. 2 Blank 7/8" Outside Diameter

8	32	36	40	$4.25
10	24	32	30	4.25
12	24	28	..	4.25
14	..	..	20, 24	4.25

No. 7000 Thred-Rite Dies

Carbon Steel

Fractional Sizes

Sizes and Prices No. 0 Blank 3/8" Outside Diameter

Cutting Size Inches	Threads per Inch				Price Each
	NC	NF	NS	Whit.	Carbon Steel
1/16	..	..	64	60	$3.25
5/32	..	..	48	48	3.25
1/8	..	..	40	40	3.25

Sizes and Prices No. 1 Blank 5/8" Outside Diameter

1/16	..	..	64	60	$3.25
5/32	..	..	48	48	3.25
1/8	..	..	40	40	3.25
5/32	..	..	32, 36	32	3.25
3/16	..	..	24, 32	24	3.25
7/32	..	..	24, 32	24	3.25
1/4	20	28	24, 32	20	3.25

Sizes and Prices No. 2 Blank 7/8" Outside Diameter

1/4	20	28	24, 32	20	$4.25
5/16	18	24	32	18	4.25
3/8	16	24	..	16	4.25

Sizes and Prices No. 3 Blank 1 1/4" Outside Diameter

3/8	16	24	..	16	$5.50
7/16	14	20	..	14	5.50
1/2	13	20	..	12	5.50
9/16	12	18	..	12	5.50
5/8	11	18	..	11	5.50

Sizes and Prices No. 4 Blank 1 3/4" Outside Diameter

5/8	11	18	..	11	$8.00
3/4	10	16	..	10	8.00
7/8	9	14	..	9	8.00
1	8	14	..	8	8.00

Sizes and Prices No. 5 Blank 2 5/32" Outside Diameter

1 1/8	7	12	..	7	$17.00

No. 7500 Thred-Rite Dies

High Speed Steel

We are listing below only those regular sizes and pitches which experience has shown to be practical and economical in High Speed Steel. However many special sizes and pitches can be so furnished. Prices on application.

Machine Screw Sizes

Sizes and Prices No. 1 Blank 5/8" Outside Diameter

Screw Gage Number	Threads per Inch			Price Each
	NC	NF	NS	High Speed Steel
2	56	64	..	$5.00
3	48	56	..	5.00
4	40	48	36	5.00
5	40	44	..	5.00
6	32	40	..	5.00
8	32	36	..	5.00
10	24	32	..	5.00
12	24	28	..	5.00

Sizes and Prices No. 2 Blank 7/8" Outside Diameter

8	32	36	..	$7.00
10	24	32	..	7.00
12	24	28	..	7.00

Fractional Sizes

Sizes and Prices No. 1 Blank 5/8" Outside Diameter

Cutting Size Inches	Threads per Inch			Price Each
	NC	NF	NS	High Speed Steel
1/4	20	28	27	$5.00

Sizes and Prices No. 2 Blank 7/8" Outside Diameter

1/4	20	28	27	$7.00
5/16	18	24	27	7.00
3/8	16	24	27	7.00

Sizes and Prices No. 3 Blank 1 1/4" Outside Diameter

3/8	16	24	27	$8.25
7/16	14	20	27	8.25
1/2	13	20	27	8.25
9/16	12	18	27	8.25
5/8	11	18	27	8.25

Sizes and Prices No. 4 Blank 1 3/4" Outside Diameter

5/8	11	18	27	$14.00
3/4	10	16	27	14.00
7/8	9	14	27	14.00
1	8	14	27	14.00

Sizes and Prices No. 5 Blank 2 5/32" Outside Diameter

1 1/8	7	12	..	$20.00
1 1/4	7	12	..	20.00
1 3/8	..	12	..	20.00
1 1/2	..	12	..	20.00

No. 7000 Thred-Rite Pipe Dies

Carbon Steel

Dies with American National Standard Taper Threads (NPT) supplied unless otherwise ordered.

Dies with American National Standard Straight Threads (NPS) supplied when ordered, at regular prices.

Dies with British Standard Pipe Threads will be supplied when so specified.

Dies cutting Left-Hand threads are special.

Pipe Sizes

Cutting Size Pipe Inches	Number of Threads to Inch	Price Each Carbon Steel
Sizes and Prices No. 2 Blank 7/8" Outside Diameter		
1/8	27	$5.00
Sizes and Prices No. 3 Blank 1 1/4" Outside Diameter		
1/8	27	$6.25
1/4	18	6.25
3/8	18	6.25
Sizes and Prices No. 4 Blank 1 3/4" Outside Diameter		
3/8	18	$10.00
1/2	14	10.00
3/4	14	10.00
Sizes and Prices No. 5 Blank 2 5/32" Outside Diameter		
1	11 1/2	$17.00

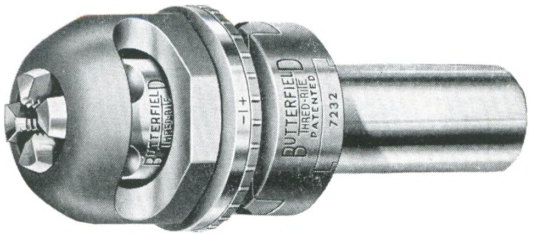
High Speed Steel

American National Standard, High Speed Steel Dies supplied with either Taper or Straight Threads as ordered.

Cutting Size Pipe Inches	Number of Threads to Inch	Price Each High Speed Steel
Sizes and Prices No. 2 Blank 7/8" Outside Diameter		
1/8	27	$7.50
Sizes and Prices No. 3 Blank 1 1/4" Outside Diameter		
1/8	27	$9.00
1/4	18	9.00
3/8	18	9.00
Sizes and Prices No. 4 Blank 1 3/4" Outside Diameter		
3/8	18	$16.00
1/2	14	16.00
3/4	14	16.00
Sizes and Prices No. 5 Blank 2 5/32" Outside Diameter		
1	11 1/2	$22.00

No. 7200 Thred-Rite Die Holder

Floating Type



PATENT PENDING

These Holders are primarily designed for use in Automatic Screw Machines and Equipment similarly provided with automatic reversing devices; yet can be used in hand operated Screw Machines or like Equipment where the desired thread length can be otherwise controlled.

Built to our own full float design these Holders will not lock under load. Further, longitudinal float has also been incorporated which will within a reasonable degree compensate for tardy cam action or drag in the machine slide.

Sizes and Prices

Holder Number	Blank Size	Price	Shank Diam. Inches	Shank Length Inches	Body Length Inches	Thread Length Capacity Inches
7210	0	$20.00	5/8	1 3/4	1 5/16	15/16
7220	0	20.00	5/8	2	1 5/16	15/16
7230	0	20.00	3/4	2 1/2	1 5/16	15/16
7211	1	18.00	5/8	1 5/8	1 9/16	1 1/16
7221	1	18.00	3/4	1 3/4	1 9/16	1 1/16
7231	1	18.00	3/4	2 5/8	1 9/16	1 1/16
7212	2	20.00	5/8	1 1/4	2	1 1/2
7222	2	20.00	3/4	1 3/8	2	1 1/2
7232	2	20.00	3/4	1 3/4	2	1 1/2
7242	2	20.00	7/8	2 3/4	2	1 1/2
7252	2	20.00	1	3 3/4	2	1 1/2
7213	3	25.00	3/4	2 1/4	2 3/4	2 1/8
7223	3	25.00	1	2 1/2	2 3/4	2 1/8
7233	3	25.00	1 1/4	2 3/4	2 3/4	2 1/8
7243	3	25.00	1 1/4	3 15/16	2 3/4	2 1/8
7214	4	38.00	1	2 1/8	3 3/4	2 3/8
7224	4	38.00	1	2 1/2	3 3/4	2 3/8
7234	4	38.00	1 1/4	2 3/4	3 3/4	2 3/8
7244	4	38.00	1 1/4	4 1/2	3 3/4	2 3/8
7254	4	38.00	1 1/2	2 7/8	3 3/4	2 3/8
7264	4	38.00	1 1/2	4 1/2	3 3/4	2 7/8
7215	5	60.00	1 1/2	3 1/2	4 1/2	3
7215	5	60.00	2	3 1/2	4 1/2	3

No. 7300 Thred-Rite Die Holder

Releasing Type

PATENT PENDING

These Holders have been designed to meet the requirements of a number of Automatic Screw Machines not provided with automatic reversing mechanism and for all types of hand operated Machines as well.

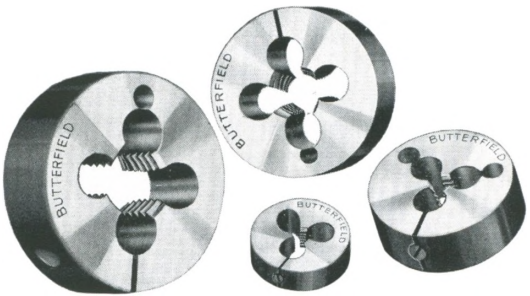
Butterfield Holders are practically shock proof, being designed to "flow" from forward drive to reverse without wall contact shock.

All Holder parts are hardened and ground and are fully interchangeable. Being carefully balanced they can be operated at any reasonable speed.

Sizes and Prices

Holder Number	Blank Size	Price	Shank Diam. Inches	Shank Length Inches	Body Length Inches	Thread Length Capacity Inches
7300	0	$27.50	½	1 1/4	1 5/8	3/4
7310	0	27.50	5/8	1 1/8	1 5/8	3/4
7301	1	27.50	5/8	1 3/8	1 11/16	13/16
7311	1	27.50	5/8	2	1 11/16	13/16
7302	2	32.75	5/8	1 1/2	2 1/8	1 1/16
7312	2	32.75	3/4	2	2 1/8	1 1/16
7322	2	32.75	3/4	1 1/2	2 1/8	1 1/16
7332	2	32.75	1	3	2 1/8	1 1/16
7303	3	38.50	3/4	2	3 1/4	2
7313	3	38.50	1	2	3 1/4	2
7323	3	38.50	1	2 1/2	3 1/4	2
7333	3	65.00	1 1/4	3 1/4	3 9/16	2 7/8
7304	4	72.00	1	2	4 1/2	3 1/2
7314	4	72.00	1 1/4	2	4 1/2	3 1/2
7324	4	72.00	1 1/2	3 1/4	4 1/2	3 1/2
7334	4	72.00	1 3/4	3	4 1/2	3 1/2

Nos. 2005 and 2010 Round Adjustable Dies



Dies 5/8 inch O.D. adjustable in holders—List No. 2005

Dies 13/16 inch O.D. and larger with taper screw adjustment—List No. 2010

Round Screw adjustable dies are adjusted by the use of a taper screw as shown in the cut and can be removed from the holder without losing the size. Used for both hand and screw machine work. They are regularly supplied with 2½ to 3 threads chamfer on the front face and 1 to 1½ threads on the back side of the die.

Holders for these dies are listed on page 82.

For sizes and prices in all regular outside diameters, see following pages.

Sizes, dimensions and threads not listed are special.

Left hand dies are special.

Nos. 2005 and 2010 Adjustable Round Split Dies

Machine Screw Sizes

Carbon Steel

O. D. 5/8 inch, Thickness 1/4 inch, List No. 2005
O. D. 13/16 inch, Thickness 1/4 inch, List No. 2010
O. D. 1 inch, Thickness 3/8 inch, List No. 2010

These dies are furnished with American National form of thread.

Sizes and dimensions not listed are special

Left hand dies are special.

For standard chamfer see Table 360.

High speed dies are special.

Sizes and Prices

Screw Gauge No.	Basic Outside Diam. Inches	Outside Diameter Price Each			Threads per Inch		
		5/8 Inch	13/16 Inch	1 Inch	N.C.	N.F.	N.S.
0	.060	$0.80	$0.90	....	..	80	..
1	.073	.80	.90	....	64	72	56
2	.086	.70	.80	....	56	64	..
3	.099	.60	.70	....	48	56	..
4	.112	.50	.60	....	40	48	32, 36
5	.125	.50	.60	....	40	44	..
6	.138	.50	.60	$.075	32	40	36
8	.164	.50	.60	.75	32	36	40
10	.190	.50	.60	.75	24	32	30
12	.216	.50	.60	.75	24	28	32
14	.242	.50	.60	.75	..	..	20, 24

No. 2010 Adjustable Round Split Dies

Fractional Sizes

Carbon Steel

Outside Diameter 1 3/16 inch. Thickness 1/4 inch.
Outside Diameter 1 inch. Thickness 3/8 inch.

These dies are furnished with American National or Whitworth form of thread at regular prices.

Sizes and dimensions not listed are special.

Left hand dies are special.

For standard chamfer see Table 360.

High speed dies are special.

Sizes and Prices

Cutting Size Inches	Outside Diameter Price Each		Threads per Inch				
	1 3/16 Inch	1 Inch	N.C.	N.F.	N.S.	Whitworth Std.	British Std. Fine
1/16	$0.90	....	..	..	64	60	..
3/32	.70	....	..	..	48	48	..
1/8	.60	$0.75	..	..	40	40	..
5/32	.60	.75	..	..	32, 36	32	..
3/16	.60	.75	..	..	24, 32	24	..
7/32	.60	.75	..	..	24, 32	24	..
1/4	.60	.75	20	28	24, 32	20	26
5/16	.60	.75	18	24	32	18	22
3/8	....	.75	16	24	..	16	20
7/16	....	.75	14	20	..	14	18

No. 2010 Adjustable Round Split Dies

Fractional Sizes

Carbon Steel

Outside Diameter 1 5/16 inches. Thickness 7/16 inch.
Outside Diameter 1 1/2 inches. Thickness 1/2 inch.
Outside Diameter 2 inches. Thickness 5/8 inch.

These dies are furnished with American National or Whitworth form of thread at regular prices.

Sizes and dimensions not listed are special.

Left hand dies are special.

For standard chamfer see Table 360.

High Speed dies are special.

Sizes and Prices

Cutting Size Inches	Outside Diameter Price Each			Threads per Inch				
	1 5/16 Inch	1 1/2 Inch	2 Inch	N.C.	N.F.	N.S.	Whitworth Std.	British Std. Fine
1/4	$1.25	$1.25	$2.00	20	28	24, 32	20	26
5/16	1.25	1.25	2.00	18	24	32	18	22
3/8	1.25	1.25	2.00	16	24	..	16	20
7/16	1.25	1.25	2.00	14	20	..	14	18
1/2	1.25	1.25	2.00	13	20	..	12	16
9/16	....	1.25	2.00	12	18	..	12	16
5/8	....	1.25	2.00	11	18	..	11	14
11/16	....	....	2.00	..	..	11, 16	11	14
3/4	....	....	2.00	10	16	..	10	12
7/8	....	....	2.00	9	14	..	9	11

No. 2010 Adjustable Round Split Dies

Fractional Sizes

Carbon Steel

Outside Diameter 2½ inches. **Thickness ¾ inch.**
Outside Diameter 3 inches. **Thickness 1 1/16 inch**

These dies are furnished with American National or Whitworth form of thread at regular prices.

Sizes and dimensions not listed are special.

Left hand dies are special.

For standard chamfer see Table 360.

High speed dies are special.

Sizes and Prices

Cutting Size Inches	Outside Diameter Price Each		Threads per Inch				
	2½ Inch	3 Inch	N. C.	N. F.	N. S.	Whitworth Std.	British Std. Fine
½	$3.00	....	13	20	..	12	16
9/16	3.00	....	12	18	..	12	16
5/8	3.00	....	11	18	..	11	14
11/16	3.00	....	..	..	11, 16	11	14
¾	3.00	....	10	16	..	10	12
7/8	3.00	$5.00	9	14	..	9	11
1	3.00	5.00	8	14	..	8	10
1 1/8	....	5.00	7	12	..	7	9
1 1/4	....	5.00	7	12	..	7	9
1 3/8	....	5.00	6	12	..	6	8
1 ½	....	5.00	6	12	..	6	8

No. 2010 Adjustable Round Split Dies

Pipe Sizes

Carbon Steel

Outside Diameter 1 inch.	**Thickness ⅜ inch.**
Outside Diameter 1½ inches.	**Thickness ½ inch.**
Outside Diameter 2 inches.	**Thickness ⅝ inch.**

These dies are furnished with American Standard Pipe form of thread.

The diameter of the thread at the small end is such that the American Standard pipe plug gauge will screw flush with the face of the die.

Sizes marked with a star (*) are thick enough to cut a true American Standard Pipe form of thread with approximately three imperfect threads.

Sizes and dimensions not listed are special.

Straight pipe dies are special.

Left hand dies are special.

For standard chamfer see Table 360.

High speed dies are special.

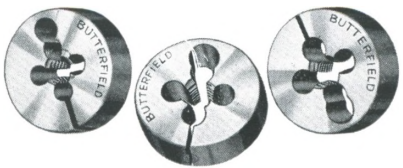
Sizes and Prices

Cutting Size Pipe Inches	Threads per Inch	Outside Diameter—Price Each		
		1 Inch	1½ Inch	2 Inch
⅛	27	*$0.75	*$1.25	.....
¼	18	.....	1.25	*$2.00
⅜	18	.....	1.50	* 2.00
½	14	.....	.....	2.00

No. 2010 Adjustable Round Split Dies

British Association Standard

Carbon Steel



Outside Diameter 13/16 inch. Thickness 1/4 inch.

These dies are furnished with British Association form of thread.

Sizes and dimensions not listed are special.

Left hand dies are special.

For standard chamfer see Table 360.

High speed dies are special.

Sizes and Prices

Number	Diameter m/m	Pitch m/m	Outside Diameter 13/16 Inch Price Each
0	6.0	1.00	$0.60
1	5.3	.90	.60
2	4.7	.81	.60
3	4.1	.73	.60
4	3.6	.66	.60
5	3.2	.59	.60
6	2.8	.53	.60
7	2.5	.48	.60
8	2.2	.43	.60
9	1.9	.39	.60
10	1.7	.35	.60
11	1.5	.31	.80
12	1.3	.28	.80
14	1.0	.23	1.10

No. 2010 Adjustable Round Split Dies

Metric Sizes

Carbon Steel

Outside Diameter 13/16 inch. **Thickness 1/4 inch.**
Outside Diameter 1 inch. **Thickness 3/8 inch.**

These dies are furnished with the French or International form of thread.

French Standard pitches, in sizes 2 m/m to 5.5 m/m, inclusive, are those adopted by the French Navy, Department of War, Railway Companies, etc., and approved by the Society for the Advancement of National Industries.

International Standard pitches under 6 m/m diameter are the German extension of the Standard International System (S. I.) by the Deutsche Industry-Normen.

The International Standard (S. I.) is the same as D. I. N. Standard in sizes 6 m/m and larger.

Sizes and dimensions not listed are special.

Left hand dies are special.

For standard chamfer see Table 360.

High speed dies are special.

Sizes and Prices

Cutting Size m/m	Outside Diameter Price Each		Pitch m/m		
	13/16 Inch	1 Inch	French Std.	International Std. (D. I. N.)	Also Furnished
1.5	$0.90	....	.35	....	....
2	.80	....	.45	.40	.50
2.3	.70	....	....	.40	....
2.5	.70	....	.45	....	....
2.6	.70	....	....	.45	....
3	.60	....	.60	.50	.75
3.5	.60	$0.75	.60	.60	....
4	.60	.75	.75	.70	....
4.5	.60	.75	.75	.75	....
5	.60	.75	.90	.80	.75, 1.00
5.5	.60	.75	.90	.90	.75
6	.60	.75	1.00	1.00	1.25
7	.60	.75	1.00	1.00	1.25
8	.60	.75	1.00	1.25	....
9	....	.75	1.00	1.25	....
10	....	.75	1.50	1.50	1.25
11	....	.75	....	1.50	....
12	....	.75	1.50	1.75	1.25

No. 2010 Adjustable Round Split Dies

Metric Sizes

Carbon Steel

Outside Diameter 1 5/16 inches. Thickness 7/16 inch.
Outside Diameter 1½ inches. Thickness ½ inch.
Outside Diameter 2 inches. Thickness ⅝ inch.

These dies are furnished with the French or International form of thread.

The International Standard (S. I.) is the same as D. I. N. Standard on sizes 6 m/m and larger.

Sizes and dimensions not listed are special.

Left hand dies are special.

For standard chamfer see Table 360.

High speed dies are special.

Sizes and Prices

Cutting Size m/m	Outside Diameter Price Each			Pitch m/m		
	1 5/16 Inch	1½ Inch	2 Inch	French Std.	International Std. (D. I. N.)	Also Furnished
6	$1.25	$1.25	....	1.00	1.00	1.25
7	1.25	1.25	....	1.00	1.00	1.25
8	1.25	1.25	....	1.00	1.25	....
9	1.25	1.25	....	1.00	1.25	....
10	1.25	1.25	....	1.50	1.50	1.25
11	1.25	1.25	....	....	1.50	....
12	1.25	1.25	$2.00	1.50	1.75	1.25
13	....	1.25	2.00	....	....	1.50, 1.75, 2.00
14	....	1.25	2.00	2.00	2.00	1.25, 1.75
15	....	1.25	2.00	....	....	1.75, 2.00
16	....	1.25	2.00	2.00	2.00	....
17	....	....	2.00	....	....	2.00
18	....	....	2.00	2.50	2.50	1.50, 2.00
19	....	....	2.00	....	....	2.50
20	....	....	2.00	2.50	2.50	2.00
22	....	....	2.00	2.50	2.50	....
24	....	....	2.00	3.00	3.00	....

No. 2010 Adjustable Round Split Dies

Metric Sizes

Carbon Steel

Outside Diameter 2½ inches. **Thickness ¾ inch.**
Outside Diameter 3 inches. **Thickness 1 1/16 inch.**

These dies are furnished with the French or International form of thread.

The International Standard (S. I.) is the same as D. I. N. standard on sizes 6 m/m and larger.

Sizes and dimensions not listed are special.

Left hand dies are special.

For standard chamfer see Table 360.

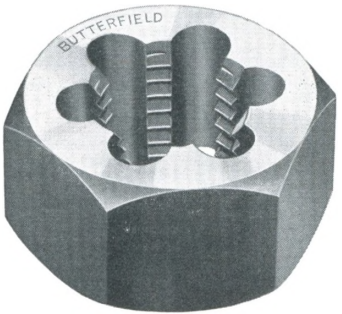
High speed dies are special.

Sizes and Prices

Cutting Size m/m	Outside Diameter Price Each		Pitch m/m		
	2½ Inch	3 Inch	French Std.	International Std. (D. I. N.)	Also Furnished
12	$3.00	....	1.50	1.75	1.25
13	3.00	....	....	....	1.50, 1.75, 2.00
14	3.00	....	2.00	2.00	1.25, 1.75
15	3.00	....	....	....	1.75, 2.00
16	3.00	....	2.00	2.00	....
17	3.00	....	....	....	2.00
18	3.00	....	2.50	2.50	1.50, 2.00
19	3.00	....	....	....	2.50
20	3.00	....	2.50	2.50	2.00
22	3.00	$5.00	2.50	2.50	....
24	3.00	5.00	3.00	3.00	....
26	3.00	5.00	3.00	....	....
27	....	5.00	....	3.00	....
28	....	5.00	3.00	....	....
30	....	5.00	3.50	3.50	....
32	....	5.00	3.50	....	....
33	....	5.00	....	3.50	....
34	....	5.00	3.50	....	....
36	....	5.00	4.00	4.00	....
38	....	5.00	4.00	....	....

No. 2025 Hexagon Rethreading Dies

Carbon Steel



These dies are used only for repair work, for dressing over bruised or rusty threads.

Hexagon rethreading dies are furnished with American National or Whitworth form of thread at regular prices.

Sizes and dimensions not listed are special.

Left hand dies are special.

For standard chamfer see Table 360.

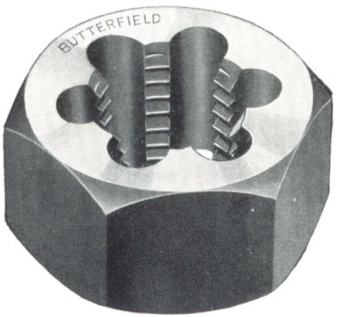
Sizes and Prices

Cutting Size Inches	Price Each	Threads per Inch				Dimensions Inches	
		N.C.	N.F.	N.S.	Whitworth-Std.	Across Flats	Thickness
1/4	$0.70	20	28	..	20	19/32	1/4
5/16	.80	18	24	..	18	11/16	5/16
3/8	.90	16	24	..	16	25/32	3/8
7/16	1.00	14	20	..	14	7/8	7/16
1/2	1.10	13	20	..	12	1 1/16	1/2
9/16	1.20	12	18	..	12	1 1/16	1/2
5/8	1.40	11	18	..	11	1 1/4	5/8
11/16	1.60	..	..	11, 16	11	1 7/16	3/4
3/4	1.80	10	16	..	10	1 7/16	3/4
7/8	2.10	9	14	..	9	1 5/8	7/8
1	2.40	8	14	..	8	1 13/16	1
1 1/8	2.80	7	12	..	7	2	1
1 1/4	3.20	7	12	..	7	2 3/16	1
1 3/8	3.60	6	12	..	6	2 3/8	1
1 1/2	4.00	6	12	..	6	2 9/16	1

Hexagon Rethreading Dies

Taper Pipe Sizes

Carbon Steel



These dies are used only for repair work, for dressing over bruised or rusty threads.

Hexagon rethreading pipe dies are standard with right hand American National Taper Pipe threads.

The diameter of the thread at the small end is such that the American Standard pipe plug gage will screw ½ to 2½ turns short of flush with the small end of the die. Hexagon rethreading dies for taper pipe have approximately one thread chamfer on the large end.

Sizes and Prices

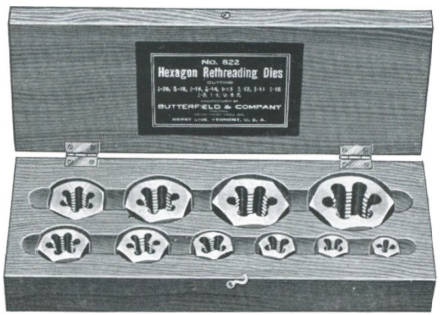
Cutting Size Inches	Price Each	Threads Per Inch	Dimensions Inches	
			Across Flats	Thickness
1/8	**	27	1 1/16	3/8
1/4	**	18	1 1/4	5/8
3/8	**	18	1 7/16	5/8
1/2	**	14	1 5/8	3/4
3/4	**	14	2	13/16
1	**	11½	2 3/8	1

** Prices on application.

No. 2025 Hexagon Rethreading Dies

In Sets

Carbon Steel



These dies can be used in socket, ratchet or monkey wrenches, for dressing over bruised and rusty threads. Each assortment conveniently packed in oil and varnish finished hinged cover case at no extra charge.

Sets Nos. 820-821-822 will be regularly furnished with American National form of thread.

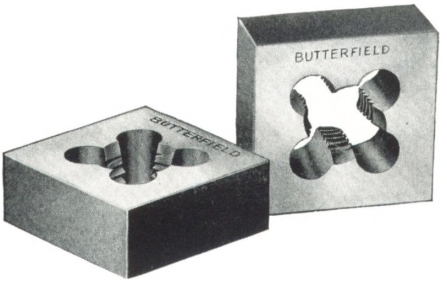
N.F. or Whitworth Standard will be substituted at same prices if so specified.

Sizes and Prices

Number	820	821	822	824		825	
	N.C.	N.C.	N.C.	N.C.	N.F.	N.C.	N.F.
Cutting Size	1/4 5/16 3/8 7/16 1/2	1/4 5/16 3/8 7/16 1/2 9/16 5/8 3/4	1/4 5/16 3/8 7/16 1/2 9/16 5/8 3/4 7/8 1	1/4 5/16 3/8 7/16 1/2	1/4 5/16 3/8 7/16 1/2	1/4 5/16 3/8 7/16 1/2 9/16 5/8 3/4	1/4 5/16 3/8 7/16 1/2 9/16 5/8 3/4
Net Weight, Lbs.	1/2	1 1/2	2 1/2	1		2 1/2	
Price, Dollars	4.50	8.90	13.40	9.00		17.80	

No. 2021 Solid Square Pipe Dies

Carbon Steel



These dies are furnished with American Standard Pipe form of thread.

The diameter of the thread at the small end is such that the American Standard Pipe plug gauge will screw approximately flush with the face of the die.

Sizes marked with a star (*) are thick enough to cut a true American Standard Pipe form of thread with approximately three imperfect threads.

Sizes and dimensions not listed are special.

Left hand dies are special.

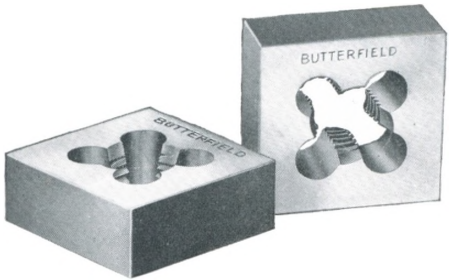
For standard chamfer see Table 360.

Sizes and Prices

Cutting Size Pipe Inches	Fitting Stocks (Nominal Size)—Price Each				
	2" Square x ½" Deep	2½" Square x ¾" Deep	3" Square x ¾" Deep	4" Square x 1" Deep	5" Square x 1¼" Deep
⅛	*$1.80	*$1.80	....	....	....
¼	1.90	* 1.90	....	....	....
⅜	2.10	* 2.10	....	....	....
½	2.40	* 2.40	*$3.10	....	....
¾	....	* 3.00	* 3.45	....	....
1	....	3.60	3.75	*$5.00	....
1¼	....	....	5.40	* 6.50	....
1½	....	....	....	* 7.50	....
2	....	....	....	8.50	....
2½	....	....	....	....	$12.50
3	....	....	....	....	15.00

No. 2020 Solid Square Bolt Dies

Carbon Steel



These dies are furnished with American National form of thread.
Sizes and dimensions not listed are special.
Left hand dies are special.
For standard chamfer see Table 360.

Sizes and Prices

Cutting Size Inches	Price Each	Threads per Inch		Dimensions—Inches	
		N.C.	N.S.	Size of Square	Thickness
1/4	$1.80	20	....	2 1/2	1/2
5/16	1.80	18	....	2 1/2	1/2
3/8	1.80	16	....	2 1/2	1/2
7/16	1.80	14	....	2 1/2	1/2
1/2	1.80	13	....	2 1/2	3/4
9/16	1.90	12	....	2 1/2	3/4
5/8	2.00	11	....	2 1/2	3/4
3/4	2.20	10	....	2 1/2	3/4
7/8	2.40	9	....	2 1/2	3/4
1	2.70	8	....	2 1/2	1
1 1/8	3.00	7	....	2 1/2	1
1 1/4	3.30	7	....	2 1/2	1
1 3/8	3.60	6	....	2 1/2	1
1 1/2	3.90	6	....	3	1
1 5/8	4.20	..	5 1/2	3	1
1 3/4	5.40	5	....	3	1 1/4
1 7/8	6.50	..	5	3 1/2	1 1/2
2	7.50	4 1/2	....	3 3/4	2

Die Stocks

For Adjustable Round Split Dies

These die stocks are designed to accommodate the round screw adjustable dies listed on the preceding pages.

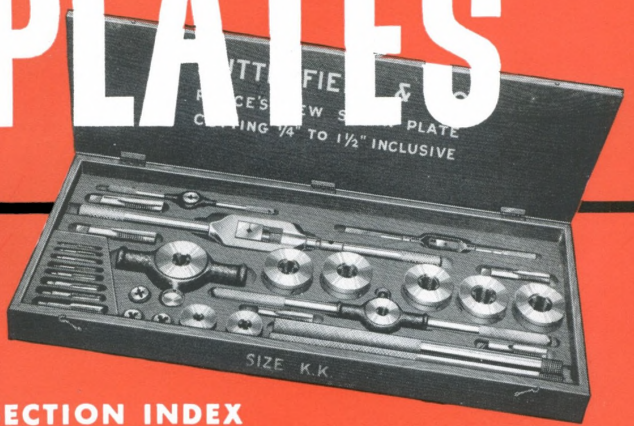
Stocks are well balanced, and while light are very strong.

All stocks have mottled finished centers carefully case-hardened for durability. Handles are knurled after polishing to provide a "non-skid" grip.

Sizes and Prices

Number	Length Inches	Outside Diameter of Die Inches	Price Each
D- 1	6	5/8	$0.75
D- 2	7	13/16	1.00
D- 3	9	1	1.25
D- 4	11	1 5/16	1.75
D- 6	14	1 1/2	2.00
D- 7	16	2	2.50
D-12	26	2 1/2	3.50

SCREW PLATES



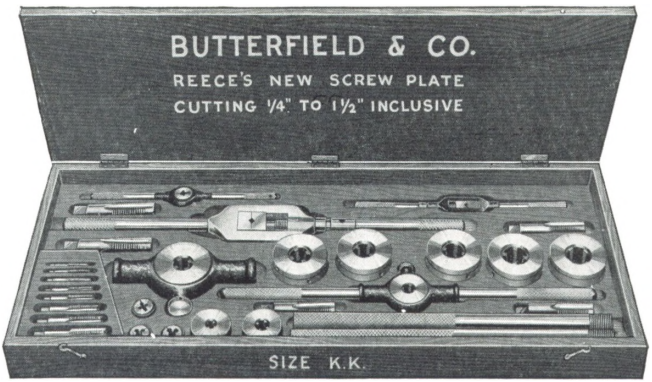
SECTION INDEX

UNION TWIST DRILL COMPANY

BUTTERFIELD DIVISION

No. 3000 Reece's Screw Plates

For the Farm, Garage, or Machine Shop where the best in thread cutting tools is desired.



On the following pages are listed Assortments with single taps—Assortments with sets of Taper, Plug and Bottoming Taps, also with National Coarse threads and National Fine threads and with both threads in combination—in fact an Assortment may be easily selected for any and every purpose.

Reece's Screw Plates

In bringing our Reece's Screw Plates to the attention of discriminating mechanics, we wish to have careful consideration given to the claims we make for them.

While there are many good Screw Plates on the market, the Reece's Screw Plate was designed by a mechanic of exceptional ability whose experience with many styles of Thread Cutting Tools had shown him their weak points and convinced him that a set with these eliminated would find favor from its inception, and with this in view, he set his mind to the development of what is known as the Reece's Screw Plate.

A few of the many claims which we make for it are as follows:

While easily adjusted by turning adjusting screws in or out as desired, it has all the advantages of a Solid Die, as the Dies themselves are held so rigidly in place by the cap when screwed down tight that they cannot be moved.

When Dies become dulled, they may be taken out and ground, by removing Cap.

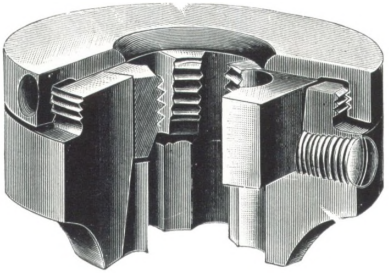
Dies may be used in Lathe or Turret by simply reversing in Collet, may be used to cut close to a shoulder by starting work with Guide side of Collet and finishing with Top.

When Dies become worn out they may be replaced at small cost, as all Dies of the same cutting size are made interchangeable.

All parts are fully guaranteed in every respect, and any proving defective will be replaced free of charge without question.

Please note carefully all points shown in illustrations on succeeding page.

Sectional View Die, Collet and Cap



COLLET

COLLET

Note strength and rigidity of die seat.

CAP

CAP

Easily removed to grind or reverse dies.

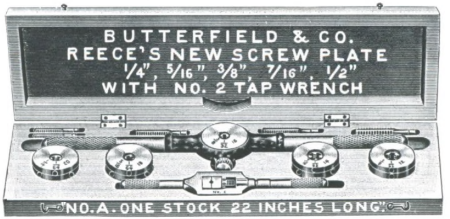
DIE

DIE

Easily sharpened, and by reversing in collet is adapted to machine use.

No. 3000 Reece's Screw Plates

With Taper Taps and Sets of Taper, Plug and Bottoming Taps



National Coarse (N.C.) threads furnished unless otherwise ordered. Whitworth Standard threads furnished at regular prices when specified.

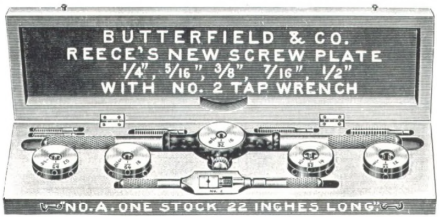
Sizes and Prices

No. (Taper Taps)	A	B	B½	C	C½	E
No. (Sets of Taps)	10A	10B	10B½	10C	10C½	10E
One taper tap and one die, collet and cap for each cutting size.	¼–20 5/16–18 ⅜–16 7/16–14 ½–13	½–13 5/8–11 ¾–10 ⅞–9 1–8	5/8–11 ¾–10 ⅞–9 1–8	¼–20 5/16–18 ⅜–16 7/16–14 ½–13 5/8–11 ¾–10	¼–20 5/16–18 ⅜–16 7/16–14 ½–13 9/16–12 5/8–11 ¾–10	¼–20 5/16–18 ⅜–16 7/16–14 ½–13 5/8–11 ¾–10 ⅞–9 1–8
Collet No.	R–12	R–12	R–12	R–12	R–12	R–12
Diam., Inches	2¾	2¾	2¾	2¾	2¾	2¾
Stocks No.	D–8	D–9	D–9	D–9	D–9	D–9
Length, Inches	22	26	26	26	26	26
Tap Wrench No.	9	11	11	10	10	9–11
Net Weight, Lbs.: Taper Taps	16½	22	19	23	24½	27½
Sets of Taps	17½	25	22	24	26	30
Price, Dollars: Taper Taps	**18.50**	**29.25**	**26.25**	**27.50**	**30.75**	**42.00**
Sets of Taps	**22.00**	**39.50**	**35.50**	**35.75**	**39.75**	**50.50**

Repair parts on pages 92–93.
Continued on page 88

No. 3000 Reece's Screw Plates

With Taper Taps and Sets of Taper, Plug and Bottoming Taps



National Coarse (N.C.) threads furnished unless otherwise ordered. Whitworth Standard threads furnished at regular prices when specified.

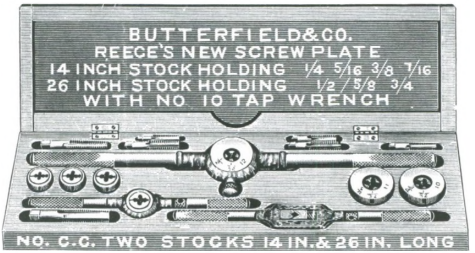
Sizes and Prices

No. (Taper Taps)	E1/2	F	G		K	
No. (Sets of Taps)	10E1/2	10F	10G		10K	
One taper tap and one die, collet and cap for each cutting size.	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13 9/16–12 5/8–11 3/4–10 7/8–9 1–8	1 1/8–7 1 1/4–7 1 3/8–6 1 1/2–6	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13 5/8–11 3/4–10 7/8–9 1–8 1 1/8–7 1 1/4–7		1/4–20 5/16–18 3/8–16 7/16–14 1/2–13 5/8–11 3/4–10 7/8–9 1–8 1 1/8–7 1 1/4–7 1 3/8–6 1 1/2–6	
Collet No.	R-12	L-B	R-12	L-B	R-12	L-B
Diam. Inches	2 3/4	4	2 3/4	4	2 3/4	4
Stocks No.	D-9	D-11	D-9	D-10	D-9	D-11
Length, Inches	26	53	26	40	26	53
Tap Wrench No.	9 11	5	10	4 1/2	10	5
Net Weight, Lbs: Taper Taps	29 1/2	59	69		94	
Sets of Taps	33	68	76		106	
Price, Dollars Taper Taps	**44.25**	**59.00**	**68.50**		**92.00**	
Sets of Taps	**54.50**	**78.00**	**89.00**		**120.00**	

Repair parts on pages 93–94.
Continued on page 89

No. 3000 Reece's Screw Plates

With Taper Taps and Sets of Taper, Plug and Bottoming Taps



National Coarse (N.C.) threads furnished unless otherwise ordered. Whitworth Standard threads furnished at regular prices when specified. Two or more stocks in each of these sets.

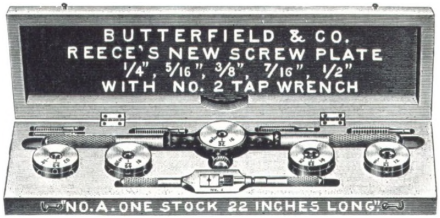
Sizes and Prices

No. (Taper Taps)	CC	EE	GG	KK
No. (Sets of Taps)	10CC	10EE	10GG	10KK
One taper tap and one die, collet and cap for each cutting size.	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13 5/8–11 3/4–10	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13 5/8–11 3/4–10 7/8–9 1–8	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13 5/8–11 3/4–10 7/8–9 1–8 1 1/8–7 1 1/4–7	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13 5/8–11 3/4–10 7/8–9 1–8 1 1/8–7 1 1/4–7 1 3/8–6 1 1/2–6
Collet No.	D-74 R-12	D-74 R-12	D-74 R-12 L-B	D-74 R-12 L-B
Diam., Inches	1 5/8 2 3/4	1 5/8 2 3/4	1 5/8 2 3/4 4	1 5/8 2 3/4 4
Stocks No.	D-5 D-9	D-5 D-9	D-5 D-9 D-10	D-5 D-9 D-11
Length, Inches	14 26	14 26	14 26 40	14 26 53
Tap Wrench No.	10	9 11	10 4 1/2	10 5
Net Weight, Lbs.: Taper Taps	19 1/4	24 1/2	66	91
Sets of Taps	20 1/2	27	73	103
Price, Dollars Taper Taps	**27.50**	**42.00**	**71.00**	**95.00**
Sets of Taps	**35.75**	**50.50**	**92.00**	**123.00**

Repair parts on pages 93–94.
Continued on page 90

No. 3000 Reece's Screw Plates

For Garage Work



Furnished with National Fine (N.F.) threads only Recommended for Automobile repair work.

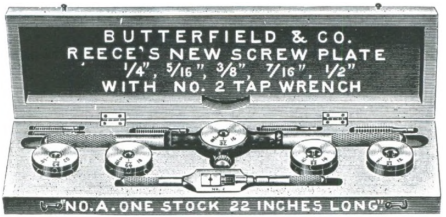
Sizes and Prices

No.	AA	CA	CE	CE½
One plug tap and one die, collet and cap for each cutting size.	1/4–28 5/16–24 3/8–24 7/16–20 1/2–20	1/4–28 5/16–24 3/8–24 7/16–20 1/2–20 5/8–18 3/4–16	1/4–28 5/16–24 3/8–24 7/16–20 1/2–20 5/8–18 3/4–16 7/8–14 1–14	1/4–28 5/16–24 3/8–24 7/16–20 1/2–20 9/16–18 5/8–18 11/16–16 3/4–16 7/8–14 1–14
Collet No. Diam., Inches	R–12 2¾	R–12 2¾	R–12 2¾	R–12 2¾
Stock No. Length, Inches	D–8 22	D–9 26	D–9 26	D–9 26
Tap Wrench No.	9	10	9 11	9 11
Net Weight, Lbs.	16½	23	27½	30
Price, Dollars	**18.50**	**27.50**	**42.00**	**50.25**

Repair parts on pages 92–93.
Continued on page 91

No. 3000 Reece's Screw Plates

For Garage and General Repair Work



Combination Sets with both N.C. and N.F. threads.

A complete assortment of both National Coarse and National Fine threads in one set.

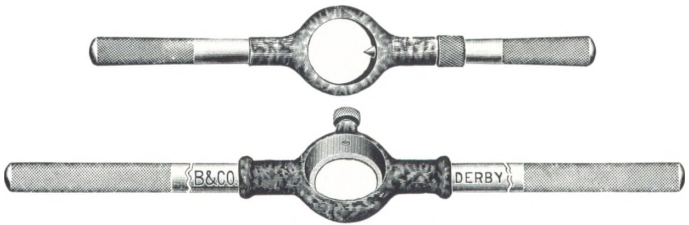
Sizes and Prices

No.	150A		150C		150C½		150E½	
Thread Standard	N.C.	N.F.	N.C.	N.F.	N.C.	N.F.	N.C.	N.F.
One each N.C. and N.F. plug tap and die, collet and cap of each cutting size.	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13	1/4–28 5/16–24 3/8–24 7/16–20 1/2–20	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13 5/8–11 3/4–10	1/4–28 5/16–24 3/8–24 7/16–20 1/2–20 5/8–18 3/4–16	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13 9/16–12 5/8–11 3/4–10	1/4–28 5/16–24 3/8–24 7/16–20 1/2–20 9/16–18 5/8–18 3/4–16	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13 9/16–12 5/8–11 3/4–10 7/8– 9 1– 8	1/4–28 5/16–24 3/8–24 7/16–20 1/2–20 9/16–18 5/8–18 3/4–16 7/8–14 1–14
Collet No. Diam., Inches	R-12 2¾		R-12 2¾		R-12 2¾		R-12 2¾	
Stock No. Length, Inches	D-8 22		D-9 26		D-9 26		D-9 26	
Tap Wrench No.	9		10		10		9	11
Net Weight, Lbs.	24½		36		40		50	
Price, Dollars	**29.25**		**50.00**		**56.00**		**79.00**	

Repair parts on pages 92–93.

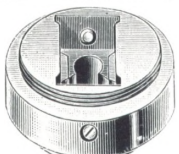
No. 3000 Reece's Screw Plates

Price List of Parts



Price List of Stocks

No. of Stock	Length of Stock Inches	Fitting Collets No.	Diameter of Collet Inches	Price Each
D-5	14	D-74	1 5/8	$2.50
D-8	22	R. 8-12	2 3/4	3.50
D-9	26	R. 8-13	2 3/4	3.50
D-10	40	L. A-L. B.	4	6.00
D-11	53	L. B-L. O.	4	8.00


COLLET

Price List of Collets and Caps


CAP

Size of Die Inches	No. of Collet	Diameter of Collet Inches	Collet	Cap	Collet and Cap
1/4 to 7/16	D-74	1 5/8	$0.75	....	....
1/4 to 3/8	R. 8	2 3/4	.80	$0.50	$1.30
7/16 to 1/2	R. 11	2 3/4	.80	.50	1.30
9/16 to 3/4	R. 12	2 3/4	.80	.50	1.30
7/8 to 1	R. 13	2 3/4	.80	.50	1.30
7/8 to 1	L. A.	4	2.00	1.00	3.00
1 1/8 to 1 1/4	L. B.	4	2.00	1.00	3.00
1 3/8 to 1 1/2	L. O.	4	2.00	1.00	3.00

When ordering, give number of Collet wanted, also cutting size of die with which Collet is to be used.

No. 3000 Reece's Screw Plates

List Prices of Extra Taps and Dies, for Screw Plates Listed on Pages 87 to 91, Inclusive

Specify Form of Thread Required

Cutting Size Inches	National Coarse	Whitworth Std.	National Fine	Diam. of Collet Inches	Price Each		
					Dies	Taper or Plug Taps	Taps per Set
1/4	20	20	28	1 5/8	$1.00	$0.45	$1.35
1/4	20	20	28	2 3/4	1.00	.45	1.35
5/16	18	18	24	1 5/8	1.00	.50	1.50
5/16	18	18	24	2 3/4	1.00	.50	1.50
3/8	16	16	24	1 5/8	1.00	.55	1.65
3/8	16	16	24	2 3/4	1.25	.55	1.65
7/16	14	14	20	1 5/8	1.00	.60	1.80
7/16	14	14	20	2 3/4	1.25	.60	1.80
1/2	13	12	20	2 3/4	1.50	.70	2.10
9/16	12	12	18	2 3/4	1.50	.80	2.40
5/8	11	11	18	2 3/4	1.75	.90	2.70
3/4	10	10	16	2 3/4	2.00	1.20	3.60
7/8	9	9	14	2 3/4	2.75	1.60	4.80
7/8	9	9	14	4	4.00	1.60	4.80
1	8	8	14	2 3/4	2.75	2.00	6.00
1	8	8	14	4	4.00	2.00	6.00
1 1/8	7	7	12	4	4.00	2.25	6.75
1 1/4	7	7	12	4	4.00	2.60	7.80
1 3/8	6	6	12	4	5.00	3.00	9.00
1 1/2	6	6	12	4	5.00	3.50	10.50

Left hand taps and dies are special.

National Coarse threads furnished unless otherwise specified.

National Fine threads supplied at regular prices when specified.

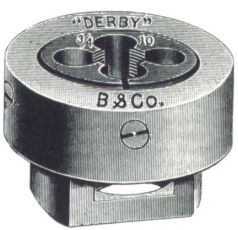
Whitworth Standard supplied at regular prices when specified.

When ordering, advise diameter or number of Collet in which dies are to be used.

No. 3100 Derby Screw Plates

The Round Die Screw Plate has always been and will always be a very popular tool with a great many mechanics, and it was to meet this demand that we placed the "Derby" Screw Plate on the market a number of years ago.

Each Die is held in a Collet; is adjustable by means of screws in the Collet, one of which enters slot in Die. Stocks, Collets and Tap Wrenches are beautifully mottled, and we recommend and guarantee our "Derby" Screw Plates in every respect.



Collet and Die

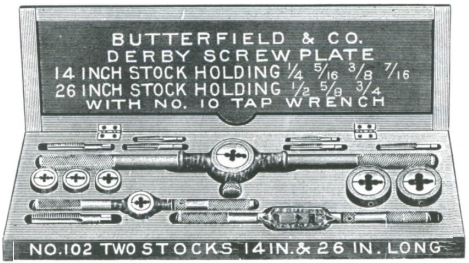
Dies 1 5/16" diameter fit Collets 1 5/8" diameter, used in Stocks 14".

Dies 2" and 2 1/4" diameter fit Collets 2 3/4" diameter used in Stocks 26".

Derby Die

No. 3100 Derby Screw Plates

With Taper Taps and Sets of Taper, Plug and Bottoming Taps



National Coarse (N.C.) threads furnished unless otherwise ordered. Whitworth threads furnished at regular prices when specified.

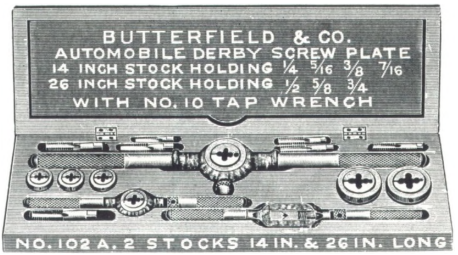
Sizes and Prices

No. (Taper Taps)	74	102	103	105	107
No. (Sets of Taps)	W74	W102	W103	W105	W107
One taper tap and one die, collet and guide for each cutting size.	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13 5/8–11 3/4–10	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13 5/8–11 3/4–10 7/8–9 1–8	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13 9/16–12 5/8–11 3/4–10	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13 9/16–12 5/8–11 3/4–10 7/8–9 1–8
Collet No.	D-74	D-74 D-100	D-74 D-100	D-74 D-100	D-74 D-100
Diam., Inches	1 5/8	1 5/8 2 3/4	1 5/8 2 3/4	1 5/8 2 3/4	1 5/8 2 3/4
Stocks No.	D-5	D-5 D-9	D-5 D-9	D-5 D-9	D-5 D-9
Length, Inches	14	14 26	14 26	14 26	14 26
Tap Wrench No.	9	10	9 11	10	9 11
Net Weight Lbs.:					
Taper Taps	6 1/2	20	24	20 1/2	27
Sets of Taps	8	23	30	25	31
Price, Dollars:					
Taper Taps	**18.50**	**27.50**	**42.00**	**30.75**	**44.25**
Sets of Taps	**22.00**	**37.75**	**50.50**	**39.75**	**54.50**

Repair parts on pages 98–99.
Continued on page 96

No. 3100 Derby Automobile Screw Plates

For Garage Work



Furnished with National Fine (N.F.) threads only. Especially recommended for Automobile repair work.

Sizes and Prices

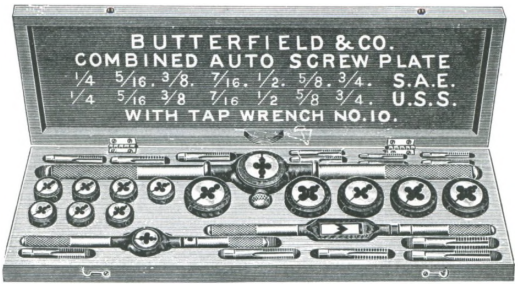
No.	74A	102A	103A	105A	107A
One plug tap and one die, collet and guide for each cutting size.	1/4–28 5/16–24 3/8–24 7/16–20 1/2–20	1/4–28 5/16–24 3/8–24 7/16–20 1/2–20 5/8–18 3/4–16	1/4–28 5/16–24 3/8–24 7/16–20 1/2–20 5/8–18 3/4–16 7/8–14 1–14	1/4–28 5/16–24 3/8–24 7/16–20 1/2–20 9/16–18 5/8–18 3/4–16	1/4–28 5/16–24 3/8–24 7/16–20 1/2–20 9/16–18 5/8–18 3/4–16 7/8–14 1–14
Collet No.	D-74	D-74 D-100	D-74 D-100	D-74 D-100	D-74 D-100
Diam., Inches	1 5/8	1 5/8 2 3/4	1 5/8 2 3/4	1 5/8 2 3/4	1 5/8 2 3/4
Stocks No.	D-5	D-5 D-9	D-5 D-9	D-5 D-9	D-5 D-9
Length, Inches	14	14 26	14 26	14 26	14 26
Tap Wrench No.	9	10	9 11	10	9 11
Net Weight, lbs.	6 1/2	20	24	20 1/2	27
Price, Dollars	**18.50**	**27.50**	**42.00**	**30.75**	**44.25**

Repair parts on pages 98–99.

Continued on page 97

No. 3100 Derby Combination Screw Plates

For Garage and General Repair Work



Combination Sets with both N.C. and N.F. threads. A complete assortment of both National Coarse and National Fine threads in one set.

Sizes and Prices

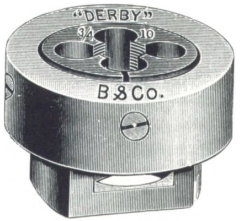
No.	274		202		203		207	
Thread Standard	N.C.	N.F.	N.C.	N.F.	N.C.	N.F.	N.C.	N.F.
One each N.C. and N.F. plug tap and die, collet and guide of each cutting size.	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13	1/4–28 5/16–24 3/8–24 7/16–20 1/2–20	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13 5/8–11 3/4–10	1/4–28 5/16–24 3/8–24 7/16–20 1/2–20 5/8–18 3/4–16	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13 5/8–11 3/4–10 7/8–9 1–8	1/4–28 5/16–24 3/8–24 7/16–20 1/2–20 5/8–18 3/4–16 7/8–14 1–14	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13 9/16–12 5/8–11 3/4–10 7/8–9 1–8	1/4–28 5/16–24 3/8–24 7/16–20 1/2–20 9/16–18 5/8–18 3/4–16 7/8–14 1–14
Collet No.	D-74		D-74	D-100	D-74	D-100	D-74	D-100
Diam., Inches	1 5/8		1 5/8	2 3/4	1 5/8	2 3/4	1 5/8	2 3/4
Stocks No.	D-5		D-5	D-9	D-5	D-9	D-5	D-9
Length, Inches	14		14	26	14	26	14	26
Tap Wrench No.	9		10		9	11	9	11
Net Weight, Lbs.	9		28		36		41	
Price, Dollars	**29.25**		**50.00**		**73.00**		**79.00**	

Repair parts on pages 98–99.

No. 3100 Derby Screw Plates

Price List of Parts

No. of Stock	Length of Stock Inches	Fitting Collets No.	Diameter Collets Inches	Price Each
D-5	14	D-74	1 5/8	$2.50
D-8	22	D-100	2 3/4	3.50
D-9	26	D-100-101	2 3/4	3.50
D-10	40	D-393-394	4	6.00
D-11	53	D-395	4	8.00



Collet and Die

Dies 1 5/16" diameter fit Collets 1 5/8" diameter, used in Stocks 14".

Dies 2" and 2 1/4" diameter fit Collets 2 3/4" diameter, used in Stocks 26".

Derby Die

Size of Die Inches	No. of Collet	Diameter of Collet Inches	Diameter of Dies Inches	Price of Collet
1/4 to 1/2	D-74	1 5/8	1 5/16	$0.75
1/2 to 3/4	D-100	2 3/4	2	1.25
7/8 to 1	D-101	2 3/4	2 1/4	1.25
7/8 to 1	D-393	4	3	2.50
1 1/8 to 1 1/4	D-394	4	3	2.50
1 3/8 to 1 1/2	D-395	4	3	2.50

When ordering, give number of Collet wanted, also cutting size of Die with which Collet is to be used.

No. 3100 Derby Screw Plates

List Prices of Extra Taps and Dies, for Screw Plates Listed on Pages 94 to 97 Inclusive

Specify Form of Thread Required

Cutting Size Inches	National Coarse	Whitworth Std.	National Fine	Diam. of Dies Inches	Price Each		
					Dies	Taper or Plug Taps	Taps per Set
1/4	20	20	28	1 5/16	$1.00	$0.45	$1.35
5/16	18	18	24	1 5/16	1.00	.50	1.50
3/8	16	16	24	1 5/16	1.00	.55	1.65
7/16	14	14	20	1 5/16	1.00	.60	1.80
1/2	13	12	20	1 5/16	1.00	.70	2.10
1/2	13	12	20	2	1.50	.70	2.10
9/16	12	12	18	2	1.50	.80	2.40
5/8	11	11	18	2	1.75	.90	2.70
3/4	10	10	16	2	2.00	1.20	3.60
7/8	9	9	14	2 1/4	2.75	1.60	4.80
1	8	8	14	2 1/4	2.75	2.00	6.00

Left hand taps and dies are special.

National Coarse threads furnished unless otherwise specified.

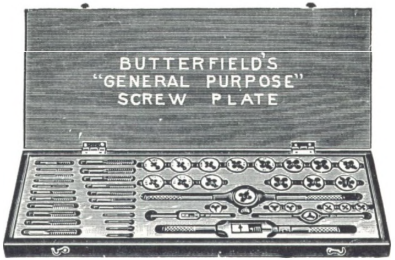
National Fine threads furnished at regular prices when specified.

Whitworth Standard furnished at regular prices when specified.

When ordering advise diameter or number of Collet in which dies are to be used.

"General Purpose" Screw Plates

A Garage Necessity



This is the original "General Purpose" Screw Plate designed and assembled with an assortment of National Coarse thread and National Fine thread Taps and Dies which will meet the needs of every garage owner.

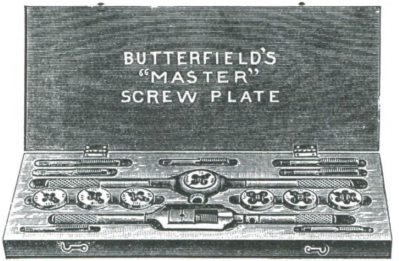
Assembled complete in a mahogany finished case.

Sizes and Prices

No.	General Purpose		
Thread Standard	Machine Screw	N.C.	N.F.
One plug tap and one round screw adjustable die for each cutting size. Also One American Standard Pipe Tap with die to match size 1/8	2–56 3–48 4–36 6–32 8–32 10–24 12–24	3/16–24 1/4–20 5/16–18 3/8–16 7/16–14 1/2–13 9/16–12	1/4–28 5/16–24 3/8–24 7/16–20 1/2–20 9/16–18 5/8–18
Dies Diam., Inches	13/16	1 1/2	1 1/2
Stock No.	D-2	D-6	
Length, Inches	7	14	
Tap Wrenches Nos.	0	2	
Net Weight, Lbs.	13		
Price, Dollars	**40.00**		

"Master" Screw Plates

For Shop and Garage



Your choice of two individual sets assembled with either National Coarse or National Fine threads.

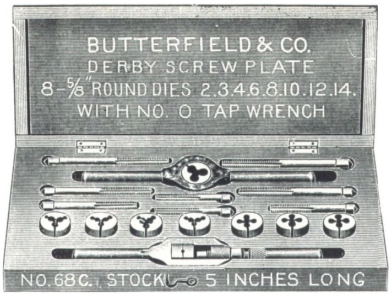
Recommended for cleaning and straightening up the threads on rusty or battered bolts.

Sizes and Prices

No.	N.C. Master	N.F. Master
One plug tap and one round screw adjustable die for each cutting size.	1/4–20 5/16–18 3/8–16 7/16–14 1/2–13 9/16–12 5/8–11	1/4–28 5/16–24 3/8–24 7/16–20 1/2–20 9/16–18 5/8–18
Dies Diam., Inches	1 1/2	1 1/2
Stock No. Length, Inches	D-6 14	D-6 14
Tap Wrench No.	2	2
Net Weight, Lbs.	7	7
Price, Dollars	**18.00**	**18.00**

No. 3150 Round Die Screw Plates

For Fine Work



Your particular attention is called to the pages following on which are shown the various Round Die Screw Plate assortments which we manufacture especially adapted to small and delicate work of all kinds.

Great care has been taken to select the catalogue assortments of cutting sizes and pitches which will in so far as possible meet the popular demand.

Owing to occasional requests for assortments other than regularly catalogued we will upon request substitute any size or pitch which may be desired, provided that regular sizes and pitches are chosen, and that they are within the range of cutting sizes already listed in the set in which such substitution is desired.

These various assortments will be found particularly adaptable to repair work on Clocks, Guns, Magnetos, Sewing Machines, Motorcycles, Bicycles, Musical Instruments, etc., and anyone engaged in such work cannot afford to be without one or more sets.

No. 3150 Round Die Screw Plates

The various assortments listed on this page have always been very popular for small work. The component parts are of the best quality, very accurate and with ordinary care will give years of satisfactory service.

Sizes and Prices

No.	68A	68B	68C	70C	70D	72A
One plug tap and one round adjustable die for each cutting size.	4–36 6–32 8–32 10–24 12–24	6–32 8–32 10–24 12–24	2–56 3–48 4–36 6–32 8–32 10–24 12–24 14–20	2–56 3–48 4–36 5–40 6–32 8–32 10–24 10–32 12–24 14–20	4–36 6–32 8–32 10–24 12–24 14–20 1/4–20 5/16–18	1/16–64 1/8–40 5/16–24 1/4–20 5/16–18
Dies Diam., Inches	5/8	5/8	5/8	5/8	13/16	13/16
Stock No.	D-1	D-1	D-1	D-1	D-2	D-2
Length, Inches	6	6	6	6	7	7
Tap Wrench No.	0	0	0	0	1	1
Net Weight, Lbs.	1 1/4	1	1 1/2	1 3/4	2	1 3/4
Price, Dollars	**7.00**	**6.50**	**9.50**	**11.00**	**11.00**	**9.00**

No. 3150 Round Die Screw Plates

The various assortments listed on this page have always been very popular for small work. The component parts are of the best quality, very accurate and with ordinary care will give years of satisfactory service.

Sizes and Prices

No.	70E	70F	70G	70H	70J	70K
One plug tap and one round screw adjustable die for each cutting size.	4–36 6–32 8–32 10–24 12–24	1/8–40 5/32–32 3/16–24 7/32–24 1/4–20	4–36 6–32 8–32 10–24 12–24 14–20	4–36 6–32 8–32 10–24 12–24 14–20 5/16–18	1/16–64 3/32–48 1/8–40 5/32–32 3/16–32 3/16–24 7/32–24 1/4–20	2–56 3–48 4–36 5–40 6–32 8–32 10–24 12–24 14–20 5/16–18
Dies Diam., Inches	13/16	13/16	13/16	13/16	13/16	13/16
Stock No.	D-2	D-2	D-2	D-2	D-2	D-2
Length, Inches	7	7	7	7	7	7
Tap Wrench No.	0	0	0	1	0	1
Net Weight, Lbs.	1¾	1¾	1¾	2	2	2½
Price, Dollars	**8.00**	**8.00**	**8.50**	**9.50**	**11.50**	**12.50**

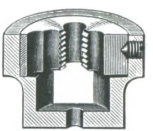
No. 3150 Round Die Screw Plates

Stocks and Collets Used

Stock holding 5/8" and 1½" diameter Dies

Stock holding 13/16" and 1" diameter Dies

Collet and Die and Die without Collet, as furnished in all of our Small Screw Plates.

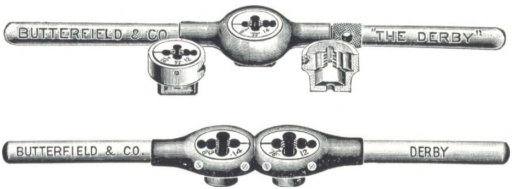


Sectional View Small Collet and Die

Sizes and Prices

No. of Stock	Length of Stock Inches	For Collets	For Dies	Price of Collet	Price of Stock
D-1	6	No Collet	5/8" diam.	....	$0.75
D-2	7	No Collet	13/16" diam.	....	1.00
D-3	9	No Collet	1" diam.	....	1.25
D-4	11	No Collet	1 5/16" diam.	....	1.75
D-5	14	1 5/8 % Holding Dies 1 5/16 %	No Die	.75	2.50
D-6	14	No Collet	1 ½" diam.	....	2.00

No. 3100 Derby Pump Stocks and Dies



These stocks are used in pump installation and repair work, to thread the coupling ends of pump rods.

Regularly furnished in three cutting sizes i.e., $\frac{3}{8}$, $\frac{1}{32}$-14, $\frac{7}{16}$, $\frac{1}{32}$-12, $\frac{1}{2}$, $\frac{1}{32}$-12 V form of thread in the assortments listed below. National Coarse form of thread will be furnished at same prices if specified.

Sizes and Prices

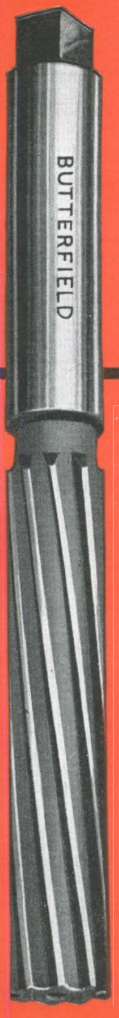
No.	Price Each	Cutting Sizes	Style	Length Inches	Weight Lbs.
29	$4.00	$\frac{3}{8}$	1—Die and Collet	14	$1\frac{1}{2}$
39	5.50	$\frac{3}{8}$–$\frac{7}{16}$	2—Dies and Collets	14	$1\frac{3}{4}$
49	7.00	$\frac{3}{8}$–$\frac{7}{16}$–$\frac{1}{2}$	3—Dies and Collets	14	$2\frac{1}{4}$
108	4.00	$\frac{3}{8}$–$\frac{7}{16}$	Double	14	$1\frac{3}{4}$

Stocks Only

No.	Price Each	Style
29	$2.50	Single
39	2.50	Single
49	2.50	Single
108	2.50	Double

Dies and Collets

Size	Price Dies	Price Collets	Diam. Dies	Diam. Collets
$\frac{3}{8}$–$\frac{1}{32}$–14	$1.00	$0.75	$1\frac{5}{16}$	$1\frac{5}{8}$
$\frac{7}{16}$–$\frac{1}{32}$–12	1.00	.75	$1\frac{5}{16}$	$1\frac{5}{8}$
$\frac{1}{2}$–$\frac{1}{32}$–12	1.00	.75	$1\frac{5}{16}$	$1\frac{5}{8}$



REAMERS

SECTION INDEX

Reamers

Carbon and High Speed Steel

In this catalog we show lists and sizes of Reamers most commonly used and which we regularly carry in stock.

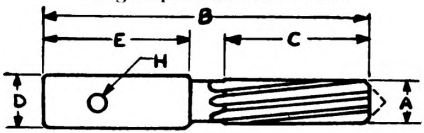
It is difficult to say just what type of Reamer should be used on different materials and different classes of work, as tolerance, material and other conditions must be considered. As Reamers are primarily intended to remove a small amount of material, in many cases, like hand reaming, a Carbon Steel Reamer may be preferable to a Reamer made from High Speed Steel. On production jobs a High Speed Steel Reamer may be more desirable.

All our Reamers are made to our standard commercial limits of accuracy. We are prepared to make Reamers to much closer limits. In the field of special Reamers we are prepared to make Reamers of various types for different operations. If we know for what purpose a Reamer is to be used we will furnish sketches and other information when necessary.

All Reamers, stock or special, are made with the intention that they shall be the best in their respective classes. Our experience and reputation for producing tools of quality is our guarantee.

Stub Screw Machine Reamers

High Speed Steel No. 4534



Stub Reamers are free cutting production tools, economical to use as their short length practically eliminates breakage.

Stub Reamers are particularly desirable on production jobs where close tolerances must be maintained without lost time in gauging small parts, sharpening tools and making machine adjustments.

These reamers are regularly furnished with right hand cut and left hand spiral flutes.

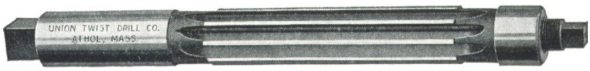
Left hand reamers and reamers with right hand spiral flutes are special. Sizes and dimensions not listed are special.

Sizes and Dimensions

Series Number	A (Range) Inches	B Inches	C Inches	D Inches	E Inches	H Inches
00	.0600 to .066 Incl.	1 3/4	1/2	1/8	1	1/16
0	.0661 to .074 Incl.	1 3/4	1/2	1/8	1	1/16
1	.0741 to .084 Incl.	1 3/4	1/2	1/8	1	1/16
2	.0841 to .096 Incl.	1 3/4	1/2	1/8	1	1/16
3	.0961 to .126 Incl.	2	3/4	1/8	1	1/16
4	.1261 to .158 Incl.	2 1/4	1	1/4	1	3/32
5	.1581 to .188 Incl.	2 1/4	1	1/4	1	3/32
6	.1881 to .219 Incl.	2 1/4	1	1/4	1	3/32
7	.2191 to .251 Incl.	2 1/4	1	1/4	1	3/32
8	.2511 to .282 Incl.	2 1/4	1	3/8	1	1/8
9	.2821 to .313 Incl.	2 1/4	1	3/8	1	1/8
10	.3131 to .344 Incl.	2 1/2	1 1/4	3/8	1	1/8
11	.3441 to .376 Incl.	2 1/2	1 1/4	3/8	1	1/8
12	.3761 to .407 Incl.	2 1/2	1 1/4	1/2	1	3/16
13	.4071 to .439 Incl.	2 1/2	1 1/4	1/2	1	3/16
14	.4391 to .470 Incl.	2 1/2	1 1/4	1/2	1	3/16
15	.4701 to .505 Incl.	2 1/2	1 1/4	1/2	1	3/16
16	.5051 to .567 Incl.	3	1 1/2	5/8	1 1/4	1/4
17	.5671 to .630 Incl.	3	1 1/2	5/8	1 1/4	1/4
18	.6301 to .692 Incl.	3	1 1/2	5/8	1 1/4	1/4
19	.6921 to .755 Incl.	3	1 1/2	3/4	1 1/4	5/16
20	.7551 to .817 Incl.	3	1 1/2	3/4	1 1/4	5/16
21	.8171 to .880 Incl.	3	1 1/2	3/4	1 1/4	5/16
22	.8801 to .942 Incl.	3	1 1/2	3/4	1 1/4	5/16
23	.9421 to 1.010 Incl.	3	1 1/2	3/4	1 1/4	5/16

Write for special circular with prices.

Expansion Hand Reamers



Expansion Hand Reamers are particularly designed for work where it is necessary to enlarge reamed holes by a few thousandths.

The recommended limits of expansion are as follows:—

1/4" to 15/32" inclusive, .006 inch
1/2" to 31/32" inclusive, .010 inch
1" to 1 1/2" inclusive, .012 inch

The guides to these Reamers are ground .005 inch undersize.

Carbon Steel

No. 4001 Straight Flutes **No. 4011 Spiral Flutes**

Diameter Inches	Price Each		Whole Length Inches	Length of Flutes Inches
	Straight Flute	Spiral Flute		
1/4	$3.00	$3.60	4	1 1/2
9/32	3.10		4	1 1/2
5/16	3.10	3.70	4	1 1/2
11/32	3.20		4	1 1/2
3/8	3.20	3.85	5	2
13/32	3.30		5	2
7/16	3.30	4.00	5	2
15/32	3.40		5	2
1/2	3.40	4.10	6	2 1/2
17/32	3.65		6	2 1/2
9/16	3.65	4.40	6	2 1/2
19/32	4.00		6	2 1/2
5/8	4.00	4.80	7	3
21/32	4.40		7	3
11/16	4.40	5.30	7	3
23/32	4.80		7	3
3/4	4.80	5.80	8	3 1/2

List continued on page 111

Expansion Hand Reamers—continued

Carbon Steel

No. 4001 Straight Flutes **No. 4011 Spiral Flutes**

Diameter Inches	Price Each		Whole Length Inches	Length of Flutes Inches
	Straight Flute	Spiral Flute		
25/32	$ 5.25		8	3 1/2
13/16	5.25	$ 6.30	8	3 1/2
27/32	5.75		8	3 1/2
7/8	5.75	6.90	9	4
29/32	6.25		9	4
15/16	6.25	7.50	9	4
31/32	6.75		9	4
1	6.75	8.10	10	4 1/2
1 1/16	7.25	8.70	10	4 1/2
1 1/8	7.75	9.30	10 1/2	4 3/4
1 3/16	8.30	10.00	10 1/2	4 3/4
1 1/4	8.90	10.70	11	5
1 5/16	9.50	11.40	11	5
1 3/8	10.50	12.60	11 1/2	5 1/4
1 7/16	11.50	13.80	11 1/2	5 1/4
1 1/2	12.50	15.00	12	5 1/2

For limits of expansion recommended for these Reamers see page 110.

Hand Reamers

Flutes are slightly tapered on end and cleared to edge.

Straight Flutes

Carbon Steel No. 4000 — **High Speed Steel No. 4500**

Spiral Flutes

Carbon Steel No. 4003 — **High Speed Steel No. 4503**

Diameter Inches	Price Each Carbon Steel		Price Each High Speed Steel		Whole Length Inches	Length of Flutes Inches
	Straight Flute	Spiral Flute	Straight Flute	Spiral Flute		
1/8	$1.00	$1.20	$3.00		3	1 1/2
9/64	1.20				3 1/4	1 5/8
5/32	1.20	1.45	3.25		3 1/4	1 5/8
11/64	1.20				3 1/2	1 3/4
3/16	1.20	1.45	3.25		3 1/2	1 3/4
13/64	1.40				3 3/4	1 7/8
7/32	1.40	1.70	3.50		3 3/4	1 7/8
15/64	1.40				4	2
1/4	1.40	1.70	3.50	$3.85	4	2
17/64	1.50				4 1/4	2 1/8
9/32	1.50	1.80	3.75	4.15	4 1/4	2 1/8
19/64	1.50				4 1/2	2 1/4
5/16	1.50	1.80	3.75	4.15	4 1/2	2 1/4
21/64	1.60				4 3/4	2 3/8
11/32	1.60	1.90	4.25	4.70	4 3/4	2 3/8
23/64	1.60				5	2 1/2
3/8	1.60	1.90	4.25	4.70	5	2 1/2

For sets of Straight Flute Hand Reamers see page 142.

List continued on page 113

Hand Reamers—continued

Straight Flutes

Carbon Steel No. 4000 **High Speed Steel No. 4500**

Spiral Flutes

Carbon Steel No. 4003 **High Speed Steel No. 4503**

Diameter Inches	Price Each Carbon Steel		Price Each High Speed Steel		Whole Length Inches	Length of Flutes Inches
	Straight Flute	Spiral Flute	Straight Flute	Spiral Flute		
25/64	$1.75				5 1/4	2 5/8
13/32	1.75	$2.10	$4.75	$5.25	5 1/4	2 5/8
27/64	1.75				5 1/2	2 3/4
7/16	1.75	2.10	4.75	5.25	5 1/2	2 3/4
29/64	1.90				5 3/4	2 7/8
15/32	1.90	2.30	5.25	5.80	5 3/4	2 7/8
31/64	1.90				6	3
1/2	1.90	2.30	5.25	5.80	6	3
17/32	2.00		5.75	6.35	6 1/4	3 1/8
9/16	2.00	2.40	5.75	6.35	6 1/2	3 1/4
19/32	2.20		6.25	6.90	6 3/4	3 3/8
5/8	2.20	2.65	6.25	6.90	7	3 1/2
21/32	2.40		6.75	7.45	7 3/8	3 11/16
11/16	2.40	2.90	6.75	7.45	7 3/4	3 7/8
23/32	2.60		7.25	8.00	8 1/8	4 1/16
3/4	2.60	3.10	7.25	8.00	8 3/8	4 3/16

For sets of Straight Flute Hand Reamers see page 142.

List continued on page 114

Hand Reamers—continued

Straight Flutes

Carbon Steel No. 4000 — **High Speed Steel No. 4500**

Spiral Flutes

Carbon Steel No. 4003 — **High Speed Steel No. 4503**

Diameter Inches	Price Each Carbon Steel		Price Each High Speed Steel		Whole Length Inches	Length of Flutes Inches
	Straight Flute	Spiral Flute	Straight Flute	Spiral Flute		
25/32	$2.80		$ 7.75	$ 8.55	8 3/4	4 3/8
13/16	2.80	$3.35	7.75	8.55	9 1/8	4 9/16
27/32	3.10		8.50	9.35	9 3/8	4 11/16
7/8	3.10	3.70	8.50	9.35	9 3/4	4 7/8
29/32	3.40		9.50	10.45	10	5
15/16	3.40	4.10	9.50	10.45	10 1/4	5 1/8
31/32	3.70		10.50	11.55	10 5/8	5 5/16
1	3.70	4.45	10.50	11.55	10 7/8	5 7/16
1 1/16	4.00		11.50	12.65	11 1/4	5 5/8
1 1/8	4.30		12.75	14.00	11 5/8	5 13/16
1 3/16	4.60		14.25	15.70	12	6
1 1/4	4.90		15.75	17.35	12 1/4	6 1/8
1 5/16	5.20		17.25	19.00	12 1/2	6 1/4
1 3/8	5.60		18.75	20.65	12 5/8	6 5/16
1 7/16	6.00		20.50	22.55	12 7/8	6 7/16
1 1/2	6.40		22.25	24.50	13	6 1/2

For sets of Straight Flute Hand Reamers see page 142.

Jobbers' Reamers

Taper Shanks

Jobbers' Reamers with taper shanks are the same design as Hand Reamers except that the shanks are tapered for machine use. Flutes are slightly tapered on end and cleared to edge.

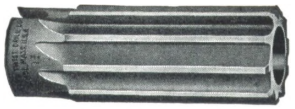
Straight Flutes

High Speed Steel No. 4506

Diameter Inches	Price Each High Speed Steel	Whole Length Inches	Length of Flutes Inches	Morse Taper Shank
1/4	$ 4.00	5 3/16	2	
9/32	4.25	5 3/16	2	
5/16	4.25	5 1/2	2 1/4	
11/32	4.75	5 1/2	2 1/4	
3/8	4.75	5 13/16	2 1/2	
13/32	5.25	5 13/16	2 1/2	No. 1
7/16	5.25	6 1/8	2 3/4	
15/32	5.75	6 1/8	2 3/4	
1/2	5.75	6 7/16	3	
17/32	6.25	6 7/16	3	
9/16	6.25	6 3/4	3 1/4	
19/32	6.75	6 3/4	3 1/4	
5/8	6.75	7 9/16	3 1/2	
21/32	7.25	7 9/16	3 1/2	
11/16	7.25	8	3 7/8	
23/32	7.75	8	3 7/8	No. 2
3/4	7.75	8 3/8	4 3/16	
13/16	8.50	8 13/16	4 9/16	
7/8	9.50	9 3/16	4 7/8	
15/16	10.50	10	5 1/8	
1	11.50	10 3/8	5 7/16	
1 1/16	12.50	10 5/8	5 5/8	No. 3
1 1/8	13.75	10 7/8	5 13/16	
1 3/16	15.25	11 1/8	6	
1 1/4	16.75	12 9/16	6 1/8	
1 5/16	18.25	12 11/16	6 1/4	
1 3/8	19.75	12 13/16	6 5/16	No. 4
1 7/16	21.50	13	6 7/16	
1 1/2	23.25	13 1/8	6 1/2	

Spiral Flute Taper Shank Jobbers' Reamers are special. Prices on application.

Fluted Shell Reamers



Fluted Shell Reamers are designed as a sizing or finishing reamer and are held on an arbor provided with driving lugs. Flutes are cleared to edge.

The holes in these reamers are tapered, 1/8 inch per foot.

Staight Flutes

High Speed Steel No. 4521

Spiral Flutes

High Speed Steel No. 4524

Spiral Fluted Reamers are Furnished R. H. Cut, R. H. Spiral

Diameter Inches	Price Each High Speed Steel		Whole Length Inches	Diameter Hole Large End Inches	Fitting Arbor No.
	Straight Flute	Spiral Flute			
3/4	$3.85	$4.25	2 1/4	3/8	4
13/16	4.00	4.40	2 1/2	1/2	5
7/8	4.25	4.70	2 1/2	1/2	5
15/16	4.50	4.95	2 1/2	1/2	5
1"	4.75	5.25	2 1/2	1/2	5
1 1/16	5.00	5.50	2 3/4	5/8	6
1 1/8	5.25	5.80	2 3/4	5/8	6
1 3/16	5.50	6.05	2 3/4	5/8	6
1 1/4	5.75	6.35	2 3/4	5/8	6
1 5/16	6.00	6.60	3	3/4	7
1 3/8	6.50	7.15	3	3/4	7
1 7/16	7.00	7.70	3	3/4	7
1 1/2	7.50	8.25	3	3/4	7
1 9/16	8.25	9.10	3	3/4	7
1 5/8	9.00	9.90	3	3/4	7

High Speed Steel Rose Shell Reamers can be furnished. Prices on application.

For Shell Reamer Arbors, see page 142.

List continued on page 117

Fluted Shell Reamers—continued

Straight Flutes

High Speed Steel No. 4521

Spiral Flutes

High Speed Steel No. 4524

Spiral Fluted Reamers are Furnished R. H. Cut, R. H. Spiral

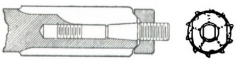
Diameter Inches	Price Each High Speed Steel		Whole Length Inches	Diameter Hole Large End Inches	Fitting Arbor No.
	Straight Flute	Spiral Flute			
1 11/16	$ 9.75	$10.75	3 1/2	1	8
1 3/4	10.50	11.55	3 1/2	1	8
1 13/16	11.25	12.40	3 1/2	1	8
1 7/8	12.00	13.20	3 1/2	1	8
1 15/16	12.75	14.05	3 1/2	1	8
2	13.50	14.85	3 1/2	1	8
2 1/16	14.25	15.70	3 3/4	1 1/4	9
2 1/8	15.00	16.50	3 3/4	1 1/4	9
2 3/16	15.75	17.35	3 3/4	1 1/4	9
2 1/4	16.50	18.15	3 3/4	1 1/4	9
2 5/16	17.25	19.00	3 3/4	1 1/4	9
2 3/8	18.00	19.80	3 3/4	1 1/4	9
2 7/16	18.75	20.65	3 3/4	1 1/4	9
2 1/2	19.50	21.45	3 3/4	1 1/4	9
2 9/16	20.50	22.55	4	1 1/2	10
2 5/8	21.75	23.95	4	1 1/2	10
2 11/16	23.00	25.30	4	1 1/2	10
2 3/4	24.25	26.70	4	1 1/2	10
2 13/16	25.50	28.05	4	1 1/2	10
2 7/8	27.00	29.70	4	1 1/2	10
2 15/16	28.50	31.35	4	1 1/2	10
3	30.00	33.00	4	1 1/2	10

High Speed Steel Rose Shell Reamers can be furnished. Prices on application.

For Shell Reamer Arbors, see page 142.

Lok-Tite Expansion Chucking Reamers

Taper Shank List No. 4540



Straight Shank List No. 4541

High Speed Steel

THIS Reamer is superior to all other types of a similar nature because of the locking feature which holds it to size after expansion.

Sizes and Prices

Diameter Inches	Price Each Straight Shank	Price Each Taper Shank	Length of Flute Inches	Length Over-all Inches	Taper Shank
3/4	$5.50	$6.00	1 3/8	9 1/2	
25/32	5.75	6.20	1 3/8	9 1/2	
13/16	6.00	6.40	1 3/8	9 1/2	
27/32	6.25	6.70	1 3/8	9 1/2	
7/8	6.50	7.00	1 1/2	10	
29/32	6.80	7.30	1 1/2	10	No. 3
15/16	7.10	7.60	1 1/2	10	
31/32	7.40	7.90	1 1/2	10	
1	7.80	8.30	1 5/8	10 1/2	
1 1/32	8.20	8.60	1 5/8	10 1/2	
1 1/16	8.60	9.00	1 5/8	10 1/2	
1 3/32	9.00	9.40	1 5/8	10 1/2	
1 1/8	9.40	9.80	1 3/4	11	
1 5/32	9.70	10.20	1 3/4	11	
1 3/16	10.00	10.60	1 3/4	11	
1 7/32	10.30	11.00	1 3/4	11	
1 1/4	10.70	11.50	1 7/8	11 1/2	
1 5/16	11.10	12.00	1 7/8	11 1/2	No. 4
1 3/8	11.50	12.50	2	12	
1 7/16	12.00	13.10	2	12	
1 1/2	12.50	13.60	2 1/8	12 1/2	
1 9/16	13.10	14.20	2 1/8	12 1/2	
1 5/8	13.70	14.85	2 1/4	13	

The expansion feature of this Reamer compensates for the wear at the point (which always goes undersize first).

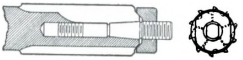
Not designed to ream smaller than the size stamped on shank.

List continued on page 119

Lok-Tite Expansion Chucking Reamers

(Continued)

Taper Shank List No. 4540



Straight Shank List No. 4541

High Speed Steel

THIS Reamer is superior to all other types of a similar nature because of the locking feature which holds it to size after expansion.

Sizes and Prices

Diameter Inches	Price Each Straight Shank	Price Each Taper Shank	Length of Flute Inches	Length Over-all Inches	Taper Shank
1 11/16	$14.30	$15.50	2 1/4	13	No. 4
1 3/4	15.00	16.30	2 3/8	13 1/2	
1 13/16	15.70	17.10	2 3/8	13 1/2	
1 7/8	16.40	18.00	2 1/2	14	
1 15/16	17.20	18.90	2 1/2	14	
2	18.00	19.80	2 1/2	14	
2 1/16	18.80	20.70	2 3/4	14 1/2	
2 1/8	19.70	21.60	2 3/4	14 1/2	
2 3/16	21.60	23.50	2 3/4	14 1/2	
2 1/4	22.50	24.50	2 3/4	14 1/2	
2 5/16	23.40	25.60	3	15	
2 3/8	24.40	26.75	3	15	No. 5
2 7/16	25.50	28.00	3	15	
2 1/2	26.60	29.30	3	15	
2 9/16	27.80	30.75	3 1/4	15 1/2	
2 5/8	29.00	32.25	3 1/4	15 1/2	
2 11/16	30.20	33.80	3 1/4	15 1/2	
2 3/4	31.50	35.40	3 1/4	15 1/2	
2 13/16	32.80	37.00	3 1/2	16	
2 7/8	34.20	38.70	3 1/2	16	
2 15/16	35.70	40.50	3 1/2	16	
3	37.30	42.50	3 1/2	16	

The expansion feature of this Reamer compensates for the wear at the point (which always goes undersize first).

Not designed to ream smaller than the size stamped on shank.

Fluted Chucking Reamers

Spiral Flutes

Straight Shank—Spiral Flutes

Taper Shank—Spiral Flutes

Fluted Chucking Reamers are designed for use in turret lathes, screw machines, etc.

These reamers have a slight chamfer of 45° on the end and flutes are cleared to edge but not tapered.

High Speed Steel—Straight Shank No. 4535

High Speed Steel—Taper Shank No. 4537

Diameter Inches	Price Each High Speed Steel		Whole Length Inches	Length of Flutes Inches	Diameter Straight Shank Inches	Morse Taper Shank
	Straight Shank	Taper Shank				
1/8	$2.20		3 1/2	7/8	7/64	
5/32	2.75		4	1	9/64	
3/16	2.75		4 1/2	1 1/8	11/64	
7/32	3.30		5	1 1/4	13/64	
1/4	3.30	$3.85	6	1 1/2	15/64	
9/32	3.60	4.15	6	1 1/2	15/64	
5/16	3.60	4.15	6	1 1/2	9/32	
11/32	4.15	4.70	6	1 1/2	9/32	No. 1
3/8	4.15	4.70	7	1 3/4	5/16	
13/32	4.70	5.25	7	1 3/4	5/16	
7/16	4.70	5.25	7	1 3/4	3/8	
15/32	5.25	5.80	7	1 3/4	3/8	

For Fluted Chucking Reamers with straight flutes see pages 122–124.

List continued on page 121

Fluted Chucking Reamers

Spiral Flutes

High Speed Steel—Straight Shank No. 4535

High Speed Steel—Taper Shank No. 4537

Diameter Inches	Price Each High Speed Steel		Whole Length Inches	Length of Flutes Inches	Diameter Straight Shank Inches	Morse Taper Shank
	Straight Shank	Taper Shank				
1/2	$ 5.25	$ 5.80	8	2	7/16	No. 1
17/32	5.80	6.35	8	2	7/16	
9/16	5.80	6.35	8	2	7/16	
19/32	6.35	6.90	8	2	7/16	
5/8	6.35	6.90	9	2 1/4	9/16	No. 2
21/32	6.90	7.45	9	2 1/4	9/16	
11/16	6.90	7.45	9	2 1/4	9/16	
23/32	7.45	8.00	9	2 1/4	9/16	
3/4	7.45	8.00	9 1/2	2 1/2	5/8	
25/32	8.00	8.80	9 1/2	2 1/2	5/8	
13/16	8.00	8.80	9 1/2	2 1/2	5/8	
27/32	8.80	9.90	9 1/2	2 1/2	5/8	
7/8	8.80	9.90	10	2 5/8	3/4	
29/32	9.90	11.00	10	2 5/8	3/4	
15/16	9.90	11.00	10	2 5/8	3/4	No. 3
31/32	11.00	12.10	10	2 5/8	3/4	
1	11.00	12.10	10 1/2	2 3/4	7/8	
1 1/16	12.40	13.50	10 1/2	2 3/4	7/8	
1 1/8	13.75	14.85	11	2 7/8	7/8	
1 3/16	15.15	16.25	11	2 7/8	1	
1 1/4	16.80	17.90	11 1/2	3	1	No. 4
1 5/16	18.70	19.80	11 1/2	3	1	
1 3/8	20.65	21.75	12	3 1/4	1	
1 7/16	22.55	23.65	12	3 1/4	1 1/4	
1 1/2	24.50	25.60	12 1/2	3 1/2	1 1/4	

For Fluted Chucking Reamers with straight flutes see pages 122–124.

Fluted Chucking Reamers

Straight Shanks—Straight Flutes

Fluted Chucking Reamers are designed for use in turret lathes, screw machines, etc.

These reamers have a slight chamfer of 45° on the end and flutes are cleared to edge but not tapered.

High Speed Steel No. 4533

Diameter Inches	Price Each High Speed Steel	Whole Length Inches	Length of Flutes Inches
1/8	$2.00	3 1/2	7/8
5/32	2.50	4	1
3/16	2.50	4 1/2	1 1/8
7/32	3.00	5	1 1/4
1/4	3.00	6	1 1/2
9/32	3.25	6	1 1/2
5/16	3.25	6	1 1/2
11/32	3.75	6	1 1/2
3/8	3.75	7	1 3/4
13/32	4.25	7	1 3/4
7/16	4.25	7	1 3/4
15/32	4.75	7	1 3/4
1/2	4.75	8	2
17/32	5.25	8	2
9/16	5.25	8	2

For Straight Shank Fluted Chucking Reamers with spiral flutes see pages 120–121.

List continued on page 123

Fluted Chucking Reamers—continued

Straight Shanks—Straight Flutes

High Speed Steel No. 4533

Diameter Inches	Price Each High Speed Steel	Whole Length Inches	Length of Flutes Inches
19/32	$ 5.75	8	2
5/8	5.75	9	2 1/4
21/32	6.25	9	2 1/4
11/16	6.25	9	2 1/4
23/32	6.75	9	2 1/4
3/4	6.75	9 1/2	2 1/2
25/32	7.25	9 1/2	2 1/2
13/16	7.25	9 1/2	2 1/2
27/32	8.00	9 1/2	2 1/2
7/8	8.00	10	2 5/8
29/32	9.00	10	2 5/8
15/16	9.00	10	2 5/8
31/32	10.00	10	2 5/8
1	10.00	10 1/2	2 3/4
1 1/16	11.25	10 1/2	2 3/4
1 1/8	12.50	11	2 7/8
1 3/16	13.75	11	2 7/8
1 1/4	15.25	11 1/2	3
1 5/16	17.00	11 1/2	3
1 3/8	18.75	12	3 1/4
1 7/16	20.50	12	3 1/4
1 1/2	22.25	12 1/2	3 1/2

For Straight Shank Fluted Chucking Reamers with spiral flutes see pages 120–121.

Fluted Chucking Reamers

Taper Shanks—Straight Flutes

Fluted Chucking Reamers are designed for use in turret lathes, screw machines, etc.

These reamers have a slight chamfer of 45° on the end and flutes are cleared to the edge but not tapered.

High Speed Steel No. 4536

Diameter Inches	Price Each High Speed Steel	Whole Length Inches	Length of Flutes Inches	Morse Taper Shank
1/4	$ 3.50	6	1 1/2	
9/32	3.75	6	1 1/2	
5/16	3.75	6	1 1/2	
11/32	4.25	6	1 1/2	
3/8	4.25	7	1 3/4	
13/32	4.75	7	1 3/4	No. 1
7/16	4.75	7	1 3/4	
15/32	5.25	7	1 3/4	
1/2	5.25	8	2	
17/32	5.75	8	2	
9/16	5.75	8	2	
19/32	6.25	8	2	
5/8	6.25	9	2 1/4	
21/32	6.75	9	2 1/4	
11/16	6.75	9	2 1/4	
23/32	7.25	9	2 1/4	
3/4	7.25	9 1/2	2 1/2	No. 2
25/32	8.00	9 1/2	2 1/2	
13/16	8.00	9 1/2	2 1/2	
27/32	9.00	9 1/2	2 1/2	
7/8	9.00	10	2 5/8	
29/32	10.00	10	2 5/8	
15/16	10.00	10	2 5/8	
31/32	11.00	10	2 5/8	
1"	11.00	10 1/2	2 3/4	No. 3
1 1/16	12.25	10 1/2	2 3/4	
1 1/8	13.50	11	2 7/8	
1 3/16	14.75	11	2 7/8	
1 1/4	16.25	11 1/2	3	
1 5/16	18.00	11 1/2	3	
1 3/8	19.75	12	3 1/4	No. 4
1 7/16	21.50	12	3 1/4	
1 1/2	23.25	12 1/2	3 1/2	

For Taper Shank Fluted Chucking Reamers with spiral flutes see pages 120–121.

Rose Chucking Reamers

Straight Shanks

Rose Chucking Reamers are designed to cut only on the end and are particularly adapted for reaming cored holes.
Flutes are ground cylindrical and cleared on chamfer only.

High Speed Steel No. 4542

Diameter Inches	Price Each High Speed Steel	Whole Length Inches	Length of Flutes Inches
1/8	$ 2.00	3 1/2	7/8
5/32	2.50	4	1
3/16	2.50	4 1/2	1 1/8
7/32	3.00	5	1 1/4
1/4	3.00	6	1 1/2
9/32	3.25	6	1 1/2
5/16	3.25	6	1 1/2
11/32	3.75	6	1 1/2
3/8	3.75	7	1 3/4
13/32	4.25	7	1 3/4
7/16	4.25	7	1 3/4
15/32	4.75	7	1 3/4
1/2	4.75	8	2
9/16	5.25	8	2
5/8	5.75	9	2 1/4
11/16	6.25	9	2 1/4
3/4	6.75	9 1/2	2 1/2
13/16	7.25	9 1/2	2 1/2
7/8	8.00	10	2 5/8
15/16	9.00	10	2 5/8
1"	10.00	10 1/2	2 3/4
1 1/16	11.25	10 1/2	2 3/4
1 1/8	12.50	11	2 7/8
1 3/16	14.00	11	2 7/8
1 1/4	15.25	11 1/2	3
1 5/16	17.00	11 1/2	3
1 3/8	18.75	12	3 1/4
1 7/16	20.50	12	3 1/4
1 1/2	22.25	12 1/2	3 1/2

Rose Chucking Reamers

Taper Shanks

Rose Chucking Reamers are designed to cut only on the end and are particularly adapted for reaming cored holes.
Flutes are ground cylindrical and cleared on chamfer only.

High Speed Steel No. 4545

Diameter Inches	Price Each High Speed Steel	Whole Length Inches	Length of Flutes Inches	Morse Taper Shank
1/4	$ 3.50	6	1 1/2	
9/32	3.75	6	1 1/2	
5/16	3.75	6	1 1/2	
11/32	4.25	6	1 1/2	
3/8	4.25	7	1 3/4	No. 1
13/32	4.75	7	1 3/4	
7/16	4.75	7	1 3/4	
15/32	5.25	7	1 3/4	
1/2	5.25	8	2	
9/16	5.75	8	2	
5/8	6.25	9	2 1/4	
11/16	6.75	9	2 1/4	
3/4	7.25	9 1/2	2 1/2	No. 2
13/16	8.00	9 1/2	2 1/2	
7/8	9.00	10	2 5/8	
15/16	10.00	10	2 5/8	
1"	11.00	10 1/2	2 3/4	
1 1/16	12.25	10 1/2	2 3/4	No. 3
1 1/8	13.50	11	2 7/8	
1 3/16	14.75	11	2 7/8	
1 1/4	16.25	11 1/2	3	
1 5/16	18.00	11 1/2	3	
1 3/8	19.75	12	3 1/4	No. 4
1 7/16	21.50	12	3 1/4	
1 1/2	23.25	12 1/2	3 1/2	

Taper Pin Reamers

With Straight Flutes

With Square Shanks

Taper 1/4 inch per foot

Point of each reamer will enter hole reamed by next smaller size.

Carbon Steel No. 4087 **High Speed Steel No. 4587**

Size No.	Price Each Carbon Steel	Price Each High Speed Steel	Diameter of Shank	Diameter of Small End	Diameter of Large End	Whole Length Inches	Length of Flutes Inches
7/0	$1.75	$3.50	5/64	.0497	.0666	1 13/16	13/16
6/0	1.60	3.50	3/32	.0611	.0806	1 15/16	15/16
5/0	1.50	3.25	7/64	.0719	.0966	2 3/16	1 3/16
4/0	1.50	3.25	1/8	.0869	.1142	2 5/16	1 5/16
3/0	1.50	3.25	9/64	.1029	.1302	2 5/16	1 5/16
2/0	1.35	3.00	5/32	.1137	.1462	2 9/16	1 9/16
0	1.00	2.80	11/64	.1287	.1638	2 15/16	1 11/16
1	1.00	2.90	3/16	.1447	.1798	2 15/16	1 11/16
2	1.25	3.00	13/64	.1605	.2008	3 3/16	1 15/16
3	1.50	3.00	15/64	.1813	.2294	3 11/16	2 5/16
4	1.75	3.25	17/64	.2071	.2604	4 1/16	2 9/16
5	2.00	3.50	5/16	.2409	.2994	4 5/16	2 13/16
6	2.25	4.25	23/64	.2773	.354	5 7/16	3 11/16
7	2.50	5.25	13/32	.3297	.422	6 5/16	4 7/16
8	3.00	6.75	7/16	.3971	.505	7 3/16	5 3/16
9	3.50	8.25	9/16	.4805	.6066	8 5/16	6 1/16
10	4.50	9.00	5/8	.5799	.7216	9 5/16	6 13/16

For sets of Straight Flute Taper Pin Reamers see page 142.

Taper Pin Reamers

With Spiral Flutes

With Square Shanks

Taper ¼ inch per foot

Point of each reamer will enter hole reamed by next smaller size.

Carbon Steel No. 4091 **High Speed Steel No. 4591**

Size No.	Price Each Carbon Steel	Price Each High Speed Steel	Diameter of Shank	Diameter of Small End	Diameter of Large End	Whole Length Inches	Length of Flutes Inches
7/0	$2.10	$3.85	5/64	.0497	.0666	1 13/16	13/16
6/0	1.95	3.85	3/32	.0611	.0806	1 15/16	15/16
5/0	1.80	3.60	7/64	.0719	.0966	2 3/16	1 3/16
4/0	1.80	3.60	1/8	.0869	.1142	2 5/16	1 5/16
3/0	1.80	3.60	9/64	.1029	.1302	2 5/16	1 5/16
2/0	1.65	3.30	5/32	.1137	.1462	2 9/16	1 9/16
0	1.20	3.10	11/64	.1287	.1638	2 15/16	1 11/16
1	1.20	3.20	3/16	.1447	.1798	2 15/16	1 11/16
2	1.50	3.30	13/64	.1605	.2008	3 3/16	1 15/16
3	1.80	3.30	15/64	.1813	.2294	3 11/16	2 5/16
4	2.10	3.60	17/64	.2071	.2604	4 1/16	2 9/16
5	2.40	3.85	5/16	.2409	.2994	4 5/16	2 13/16
6	2.70	4.70	23/64	.2773	.354	5 7/16	3 11/16
7	3.00	5.80	13/32	.3297	.422	6 5/16	4 7/16
8	3.60	7.45	7/16	.3971	.505	7 3/16	5 3/16
9	4.20	9.10	9/16	.4805	.6066	8 5/16	6 1/16
10	5.40	9.90	5/8	.5799	.7216	9 5/16	6 13/16

Taper Pin Reamers

With Helical Flutes

Taper ¼ inch per foot

The helical construction of these reamers has a tendency to prevent chips from clogging in the flutes, reducing breakage to a minimum.

Point of each reamer will enter hole reamed by next smaller size.

High Speed Steel No. 4588

Size No.	Price Each High Speed Steel	Diameter of Shank	Diameter of Small End	Diameter of Large End	Whole Length Inches	Length of Flutes Inches
7/0	$2.75	5/64	.0497	.0666	1 13/16	13/16
6/0	2.50	3/32	.0611	.0806	1 15/16	15/16
5/0	2.50	7/64	.0719	.0966	2 3/16	1 3/16
4/0	2.50	1/8	.0869	.1142	2 5/16	1 5/16
3/0	2.25	9/64	.1029	.1302	2 5/16	1 5/16
2/0	2.25	5/32	.1137	.1462	2 9/16	1 9/16
0	2.25	11/64	.1287	.1638	2 15/16	1 11/16
1	2.50	3/16	.1447	.1798	2 15/16	1 11/16
2	2.75	13/64	.1605	.2008	3 3/16	1 15/16
3	3.00	15/64	.1813	.2294	3 11/16	2 5/16
4	3.50	17/64	.2071	.2604	4 1/16	2 9/16
5	3.75	5/16	.2409	.2994	4 5/16	2 13/16
6	4.25	23/64	.2773	.354	5 7/16	3 11/16
7	5.00	13/32	.3297	.422	6 5/16	4 7/16
8	5.75	7/16	.3971	.505	7 3/16	5 3/16
9	6.25	9/16	.4805	.6066	8 5/16	6 1/16
10	7.50	5/8	.5799	.7216	9 5/16	6 13/16

Helical Die Makers' Reamers

Taper 5/32 inch to the foot

High Speed Steel No. 4589

DESIGNED and graduated in sizes for use in the Die Sinking Industry. Holes for any pattern, large or small, may be drilled close together and then by enlarging with one of these Reamers, the intervening metal may be easily removed.

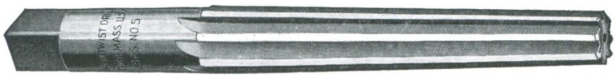
Sizes and Prices

Size	Price Each High Speed Steel	Diameter at Small End	Diameter at Large End	Total Length Inches
AAA	$3.00	.055	.070	2 1/4
AA	3.00	.065	.080	2 1/4
A	3.00	.075	.090	2 1/4
B	2.75	.085	.103	2 3/8
C	2.75	.095	.113	2 1/2
D	2.75	.105	.126	2 5/8
E	2.75	.115	.136	2 3/4
F	3.00	.125	.148	3
G	3.00	.135	.158	3
H	3.50	.145	.169	3 1/4
I	3.50	.160	.184	3 1/4
J	3.50	.175	.199	3 1/4
K	4.25	.190	.219	3 1/2
L	4.25	.205	.234	3 1/2
M	4.25	.220	.252	4
N	5.00	.235	.274	4 1/2
O	5.25	.250	.296	5
P	5.50	.275	.327	5 1/2
Q	5.75	.300	.358	6
R	6.00	.335	.397	6 1/2
S	6.25	.370	.435	6 3/4
T	6.75	.405	.473	7
U	7.00	.440	.511	7 1/4

Taper Reamer

Brown & Sharpe Standard

Finishing Reamer



These reamers are designed for reaming Brown & Sharpe standard tapers.

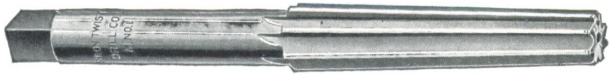
Carbon Steel No. 4096 **High Speed Steel No. 4596**

No. of Taper	Price Each Carbon Steel	Price Each High Speed Steel	Dimensions—Inches			
			Diameter			Length
			Small End	Large End	Shank	Over-all
1	$1.75	$ 4.25	.1974	.3176	9/32	4 3/4
2	2.00	4.75	.2474	.3781	11/32	5 1/8
3	2.25	5.00	.3099	.4510	13/32	5 1/2
4	2.50	5.30	.3474	.5017	7/16	5 7/8
5	3.00	5.95	.4474	.6145	9/16	6 3/8
6	3.25	6.25	.4974	.6808	5/8	6 7/8
7	3.50	6.80	.5974	.8011	3/4	7 1/2
8	3.75	9.00	.7474	.9770	13/16	8 1/8
9	4.00	11.50	.8974	1.1530	1	8 7/8
10	5.00	15.10	1.0420	1.3376	1 1/8	9 3/4
11	6.00	22.25	1.2474	1.5657	1 1/4	10 5/8
12	8.00	28.35	1.4974	1.8409	1 1/2	11 3/8

Roughing Reamers can be furnished at special prices.

Prices on application.

Morse Taper Reamers



Finishing Reamer

Roughing Reamer

Finishing Reamer **Carbon Steel No. 4051**

No. of Taper	Price Each Carbon Steel	Dimensions—Inches			
		Diameter			Length Over-all
	Finishing	Small End	Large End	Shank	
0	$1.60	.2503	.3674	5/16	3 3/4
1	2.00	.3674	.5170	7/16	5
2	2.60	.5696	.7444	5/8	6
3	3.40	.7748	.9881	7/8	7 1/4
4	4.20	1.0167	1.2893	1 1/8	8 1/2
5	6.60	1.4717	1.8005	1 1/2	9 3/4
6	12.00	2.1119	2.5550	2	12 1/4

Finishing Reamer **High Speed Steel No. 4551**
Roughing Reamer **High Speed Steel No. 4554**

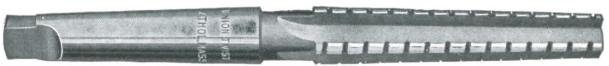
No. of Taper	Price Each High Speed Steel		Dimensions—Inches			
			Diameter			Length Over-all
	Finishing	Roughing	Small End	Large End	Shank	
0	$ 3.75	$ 4.15	.2503	.3674	5/16	3 3/4
1	4.85	5.35	.3674	.5170	7/16	5
2	5.75	6.35	.5696	.7444	5/8	6
3	8.40	9.25	.7748	.9881	7/8	7 1/4
4	12.30	13.55	1.0167	1.2893	1 1/8	8 1/2
5	23.55	25.90	1.4717	1.8005	1 1/2	9 3/4
6	52.10	57.30	2.1119	2.5550	2	12 1/4

For sets of Carbon Steel Straight Shank Morse Taper Finishing Reamers see page 142.

Morse Taper Reamers

With Taper Shanks

Finishing Reamer



Roughing Reamer

Finishing Reamer — **High Speed Steel No. 4557**

Roughing Reamer — **High Speed Steel No. 4560**

No. of Taper	Price Each High Speed Steel		Dimensions—Inches			No. of Taper Shank
			Diameter		Length Over-all	
	Finishing	Roughing	Small End	Large End		
0	$ 4.95	$ 5.40	.2503	.3674	5 11/32	0
1	6.25	6.85	.3674	.5170	6 5/16	1
2	7.50	8.20	.5696	.7444	7 3/8	2
3	10.40	11.35	.7748	.9881	8 7/8	3
4	16.55	18.05	1.0167	1.2893	10 7/8	4
5	32.75	35.80	1.4717	1.8005	13 1/8	5
6	75.45	82.70	2.1119	2.5550	17 13/16	6

Center Reamers

Fluted Type

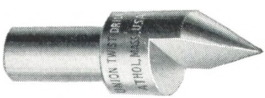
These reamers are regularly furnished with 60° or 82° included angle. When ordering specify the degree of angle required.

Carbon Steel No. 4108 **High Speed Steel No. 4608**

Size Cut Inches	Price Each Carbon Steel	Price Each High Speed Steel	Whole Length Inches	Diameter Shank Inches	Length Shank Inches
1/4	$0.40	$1.00	1 1/2	3/16	3/4
3/8	.45	1.15	1 3/4	1/4	7/8
1/2	.55	1.40	2	3/8	1
5/8	.70	1.75	2 1/4	3/8	1
3/4	.85	2.15	2 5/8	1/2	1 1/4

Center Reamers

Flatted Type

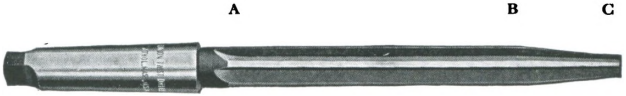


Center Reamers—Flatted Type can be furnished either Carbon Steel or High Speed Steel 60° or 82° included angle.

Prices on application.

Bridge and Boiler Reamers

Taper Shank—Straight Flutes



High Speed Steel No. 4584

Diameter Inches at A and B	Diameter Inches at C	Price Each High Speed Steel	Whole Length Inches	Length of Flutes Inches	Morse Taper Shank
13/32	7/32	$ 3.40	8 1/4	4 3/8	
7/16	1/4	3.40	8 1/4	4 3/8	
15/32	1/4	3.65	9	5 1/8	
1/2	9/32	3.65	9	5 1/8	No. 2
17/32	5/16	4.00	9	5 1/8	
9/16	11/32	4.00	9	5 1/8	
5/8	3/8	4.70	10	6 1/8	
11/16	25/64	5.50	11 3/4	7 1/8	
3/4	7/16	6.00	12	7 3/8	
13/16	1/2	6.50	12	7 3/8	
7/8	9/16	7.00	12	7 3/8	
15/16	5/8	7.75	12	7 3/8	No. 3
1"	11/16	8.50	12	7 3/8	
1 1/16	3/4	9.50	12	7 3/8	
1 1/8	13/16	10.50	12	7 3/8	
1 3/16	7/8	11.75	12	7 3/8	
1 1/4	15/16	14.00	13	7 3/8	
1 5/16	1"	15.50	13	7 3/8	
1 3/8	1 1/16	17.50	13	7 3/8	No. 4
1 7/16	1 1/8	19.50	13	7 3/8	
1 1/2	1 3/16	22.00	13	7 3/8	

32nd sizes not listed will be made to linear dimensions of the next largest size with diameters proportionate.

Prices on application.

Bridge and Boiler Reamers

Taper Shank—Spiral Flutes

High Speed Steel No. 4585

Diameter Inches at A and B	Diameter Inches at C	Price Each	Whole Length Inches	Length of Flutes Inches	Morse Taper Shank
13/32	7/32	$ 3.40	8 1/4	4 3/8	No. 2
7/16	1/4	3.40	8 1/4	4 3/8	
13/32	1/4	3.65	9	5 1/8	
1/2	9/32	3.65	9	5 1/8	
17/32	5/16	4.00	9	5 1/8	
9/16	11/32	4.00	9	5 1/8	
5/8	3/8	4.70	10	6 1/8	
11/16	25/64	5.50	11 3/4	7 1/8	No. 3
3/4	7/16	6.00	12	7 3/8	
13/16	1/2	6.50	12	7 3/8	
7/8	9/16	7.00	12	7 3/8	
15/16	5/8	7.75	12	7 3/8	
1"	11/16	8.50	12	7 3/8	
1 1/16	3/4	9.50	12	7 3/8	
1 1/8	13/16	10.50	12	7 3/8	
1 3/16	7/8	11.75	12	7 3/8	
1 1/4	15/16	14.00	13	7 3/8	No. 4
1 5/16	1"	15.50	13	7 3/8	
1 3/8	1 1/16	17.50	13	7 3/8	
1 7/16	1 1/8	19.50	13	7 3/8	
1 1/2	1 3/16	22.00	13	7 3/8	

32nd sizes not listed will be made to linear dimensions of the next largest size with diameters proportionate.

Prices on application.

Bridge and Boiler Reamers

Short Set

Taper Shank

Spiral Flute, High Speed Steel No. 4586

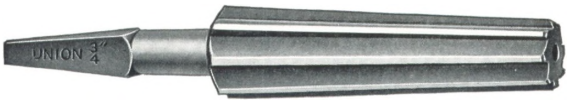
Straight Flute, High Speed Steel No. 4583

Diameter Inches at A and B	Diameter Inches at C	Price Each Straight and Spiral Flute	Whole Length Inches	Length of Flutes Inches	Morse Taper Shank
1/4	1/8	$ 2.55	5 7/16	2 1/2	
9/32	5/32	2.55	5 7/16	2 1/2	
5/16	11/64	2.70	5 11/16	2 3/4	No. 1
11/32	13/64	2.80	5 11/16	2 3/4	
3/8	15/64	2.80	5 11/16	2 3/4	
13/32	17/64	3.00	6 3/16	2 3/4	
7/16	1/4	3.10	6 15/16	3 1/2	
15/32	9/32	3.35	7 1/16	3 1/2	
1/2	19/64	3.45	7 9/16	4	No. 2
17/32	1/4	3.65	7 9/16	4	
9/16	9/32	3.65	7 9/16	4	
5/8	5/16	4.00	8 1/16	4 1/2	
11/16	3/8	4.50	8 13/16	4 1/2	
3/4	13/32	5.00	9 1/2	5	
13/16	15/32	5.35	9 1/2	5	
7/8	17/32	5.70	9 1/2	5	
15/16	19/32	6.20	9 1/2	5	No. 3
1"	21/32	6.75	9 1/2	5	
1 1/16	23/32	7.50	9 1/2	5	
1 1/8	25/32	8.25	9 1/2	5	
1 3/16	27/32	9.25	9 1/2	5	
1 1/4	29/32	11.00	9 1/2	5	

32nd sizes not listed will be made to linear dimensions of the next largest size with diameters proportionate.

Prices on application.

Bit Stock Taper Reamers



All sizes have Standard Taper Square Shank. 3/16" x 3/8" x 1 1/4" long.

Diameter at larger end of flutes is 1/16 inch larger than nominal size. Taper 1 inch per foot.

Carbon Steel No. 4069

Nominal Size Inches	Price Each	Whole Length Inches	Length of Flutes Inches	Diameter Small End Inches	Diameter Large End Inches
1/8	$0.60	3 3/4	1 5/8	.052	3/16
3/16	.60	3 7/8	1 3/4	.104	1/4
1/4	.60	4	1 7/8	.156	5/16
5/16	.60	4 1/8	2	.208	3/8
3/8	.65	4 1/4	2 1/8	.260	7/16
7/16	.70	4 3/8	2 1/4	.313	1/2
1/2	.75	4 1/2	2 3/8	.365	9/16
9/16	.80	4 5/8	2 1/2	.417	5/8
5/8	.95	4 3/4	2 5/8	.469	11/16
11/16	1.10	4 7/8	2 3/4	.521	3/4
3/4	1.25	5	2 7/8	.573	13/16
13/16	1.50	5 1/8	3	.626	7/8
7/8	1.75	5 1/4	3 1/8	.677	15/16
15/16	2.00	5 3/8	3 1/4	.730	1"
1"	2.25	5 1/2	3 3/8	.782	1 1/16

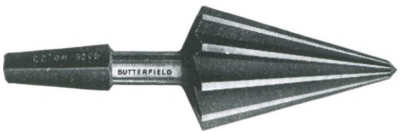
For sets of Bit Stock Taper Reamers see page 142.

Burring Reamers

For Pipe, Etc.

BURRING Reamers are made of high grade tool steel and designed particularly for removing burrs, caused by cutting pipe.

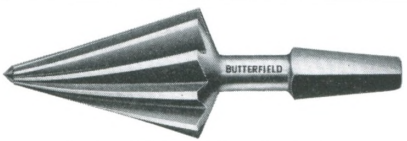
They are used extensively for countersinking and for enlarging holes in sheet steel, iron, copper, brass, etc.



Straight Flute, List No. 4111

Sizes and Prices

Number	Style of Shank	Capacity Pipe Inches	Diameter, Inches		Price Each
			At Large End	At Small End	
3	Bit Brace	½ to 1	1¼	7/16	$1.25
4	½" Round	½ to 1	1¼	7/16	1.25
33	Bit Brace	⅛ to 1¼	1½	⅛	1.50
333	½" Round	⅛ to 1¼	1½	⅛	1.50
5	Bit Brace	1¼ to 2	2⅛	13/16	3.00
55	½" Round	1¼ to 2	2⅛	13/16	3.00



Spiral Flute, List No. 4112

Sizes and Prices

Number	Style of Shank	Capacity Pipe Inches	Diameter, Inches		Price Each
			At Large End	At Small End	
6	Bit Brace	⅛ to 1¼	1½	⅛	$1.50
7	Bit Brace	¼ to 2	2⅛	¼	3.00

No. 4109 Repairman's Taper Reamers

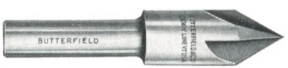
USED extensively by garages, blacksmiths, carpenters, machinists, electricians, plumbers, etc., for enlarging holes in both metal and wood. For use in Bit Brace.

Sizes and Prices

Number	Diameter, Inches		Length, Inches		Price Each
	At Large End	At Point	Overall	Flutes	
35	17/32	1/8	5 3/4	4	$1.00
36	7/8	3/16	4 7/8	3	1.25
37	1	3/8	6 1/2	4 1/2	1.50

Countersinks

No. 4105



No. 4102

Sizes and Prices

Number		Size Cut		Price Each
Bit Brace Shank	1/2 inch Round Shank	Diameter Inches	Angle Degrees	
4105A	4102F	1/2	25	$0.60
4105B	4102G	5/8	60, 82	.80
4105C	4102H	3/4	60, 82	1.05
4105D	4102I	7/8	60, 82	1.20
4105E	4102J	1	60, 82	1.40

Hand Reamers

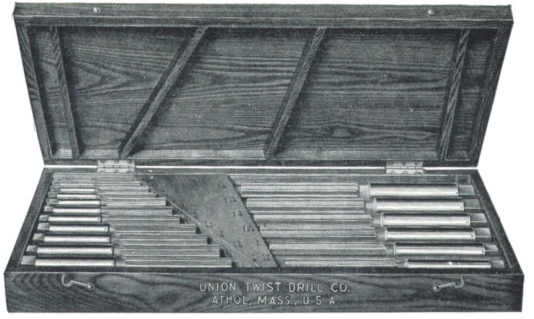
Straight Flutes

Metric Sizes

Carbon Steel No. 4010

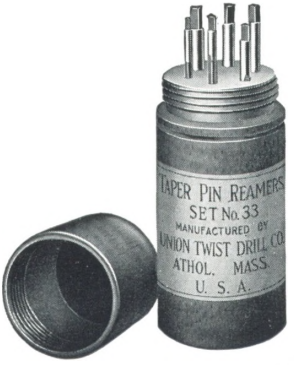
Diameter mm.	Price Each Carbon Steel	Decimal Equivalent	Whole Length mm.
3	$1.00	.1181	76
3½	1.20	.1378	79
4	1.20	.1575	82
4½	1.20	.1772	89
5	1.40	.1968	92
5½	1.40	.2165	95
6	1.40	.2362	102
6½	1.50	.2559	105
7	1.50	.2756	108
7½	1.50	.2953	112
8	1.60	.3150	117
8½	1.60	.3346	121
9	1.60	.3543	124
9½	1.60	.3740	127
10	1.75	.3937	133
10½	1.75	.4134	136
11	1.75	.4331	140
11½	1.90	.4528	143
12	1.90	.4724	149
13	2.00	.5118	155
14	2.00	.5512	165
15	2.20	.5905	171
16	2.40	.6299	182
17	2.40	.6693	190
18	2.60	.7087	206
19	2.60	.7480	213
20	2.80	.7874	226
21	3.10	.8268	233
22	3.10	.8661	246
23	3.40	.9055	256
24	3.70	.9449	267
25	3.70	.9842	274

Reamer Sets



Carbon Steel

No. 25 Set Hand Reamers ¼″ to 1″ by 16ths in case complete, $38.50
No. 26 Set Hand Reamers ¼″ to 1¼″ by 16ths in case complete, 58.25
No. 27 Set Hand Reamers ¼″ to 1½″ by 16ths in case complete, 82.00
No. 28 Set Hand Reamers ¼″ to 2″ by 16ths in case complete, 154.00
No. 29 Set Hand Reamers ¼″ to 1″ by 32ds in case complete, 68.75
No. 34 Taper-Pin Reamers Nos. 0 to 10 inclusive in case complete, 28.50
No. 35 Morse Taper Finishing Reamers Straight Shank Nos. 1 to 5 inclusive in case complete, 25.00
No. 36 Bit Stock Taper Reamers ¼″ to ¾″ by 16ths in case complete, 8.50



No. 33

Taper-Pin Reamer Set

For use in Automobile Kit.

Nos. 0 to 5 inclusive.

Price complete with Box, $9.75

Shell Reamer Arbors

With Straight Shanks

No. 4135

No.	Price Each	Fitting Sizes Inches	Whole Length Inches	Length of Shank Inches	Diameter of Shank Inches
4	$2.70	21/32 to 25/32	9	6 5/32	1/2
5	3.00	13/16 to 1 1/32	9 1/2	6 11/32	5/8
6	3.30	1 1/16 to 1 9/32	10	6 13/32	3/4
7	3.60	1 5/16 to 1 21/32	11	7 5/32	7/8
8	4.00	1 11/16 to 2	12	7 17/32	1 1/8
9	4.50	2 1/16 to 2 1/2	13	8 9/32	1 3/8
10	5.25	2 9/16 to 3	14	8 29/32	1 5/8

These Arbors are designed to fit Shell Reamers and Shell Drills having taper holes 1/8 inch per foot.

For Shell Reamers see pages 116-117.

Shell Reamer Arbors

With Morse Taper Shanks

No. 4140

No.	Price Each	Fitting Sizes Inches	Whole Length Inches	Morse Taper Shank No.
4	$3.25	21/32 to 25/32	9	2
5	3.60	13/16 to 1 1/32	9 1/2	2
6	3.95	1 1/16 to 1 9/32	10	3
7	4.30	1 5/16 to 1 21/32	11	3
8	4.80	1 11/16 to 2	12	4
9	5.40	2 1/16 to 2 1/2	13	4
10	6.30	2 9/16 to 3	14	5

These Arbors are designed to fit Shell Reamers and Shell Drills having taper holes 1/8 inch per foot.

For Shell Reamers see pages 116-117.

BUTTERFIELD

"THE
BETTER
TOOLS"

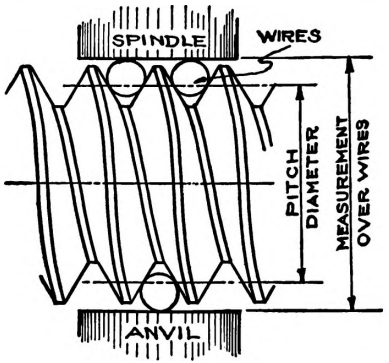
TABLES AND GENERAL INFORMATION

SECTION INDEX

Index of Tables

TABLE 300

Three Wire System of Measurement



The demand for closer accuracy in tapped holes than has been required in the past has led to great refinements in the manufacturing of taps, which necessitates more accurate methods and instruments for measuring.

The so-called "Three Wire System" has become universally recognized and adopted as the most accurate and satisfactory commercial method devised for measuring Pitch Diameters of Taps.

It is essential in using this method that the micrometers used be accurate and the measuring faces flat and parallel; that the wires used be hardened. The surfaces must be properly finished and the set of wires the same diameter within .00003 inch if measurement within .0001 inch is desired.

The "best" size wire to use is one whose diameter is such that the point of contact with the sides of the thread will come at the mid slope as at this point the least error will be introduced due to any error in the angle of thread.

Above will be found a diagram showing the method of applying the wires for the measurement of a thread.

On page 158 will be found the best size wires to use for the various pitches and the constant to subtract from the micrometer reading to obtain the pitch diameter.

The wire sizes and constants given are for use with a thread which has an included angle of 60°.

TABLE 300

Three Wire System of Measurement

Table of Wire Sizes and Constants for Obtaining Pitch Diameters

Threads per Inch	Pitch	Correct Size Wire	Constant for Correct Wire	Single Depth Nat. Form Thread	Single Depth V Form
4	.250000	.1443387	.216509	.162379	.216506
4½	.222222	.1282998	.192449	.144337	.192450
5	.200000	.1154700	.173205	.129903	.173205
5½	.181818	.1049727	.157459	.118093	.157459
6	.166666	.0962250	.144338	.108253	.144337
7	.142857	.0824786	.123718	.092788	.123717
8	.125000	.0721687	.108253	.081189	.108253
9	.111111	.0641500	.096225	.072168	.096225
10	.100000	.0577350	.086602	.064952	.086602
11	.090909	.0524863	.078729	.059046	.078729
12	.083333	.0481125	.072169	.054127	.072168
13	.076923	.0444115	.066617	.049963	.066617
14	.071428	.0412393	.061859	.046394	.061858
16	.062500	.0360841	.054125	.040595	.054126
18	.055555	.0320746	.048110	.036086	.048112
19	.052631	.0303865	.045579	.034185	.045580
20	.050000	.0288675	.043301	.032475	.043301
22	.045454	.0262431	.039365	.029523	.039364
24	.041666	.0240553	.036082	.027063	.036084
27	.037037	.0213833	.032075	.024056	.032075
28	.035714	.0206194	.030929	.023917	.030929
30	.033333	.0192448	.028867	.021651	.028867
32	.031250	.0180421	.027063	.020297	.027063
34	.029411	.0169804	.025470	.019103	.025471
36	.027777	.0160370	.024055	.018042	.024057
40	.025000	.0144337	.021650	.016237	.021650
44	.022727	.0131214	.019682	.014761	.019682
48	.020833	.0120279	.018041	.013531	.018042
50	.020000	.0115470	.017320	.012990	.017320
56	.017857	.0103097	.015464	.011598	.015465
64	.015625	.0090210	.013531	.010148	.013531

TABLE 301

Standard System of Marking

1. General.

Manufacturers of small tools recognizing the necessity of a standard system of marking taps, dies and other threading tools will mark their tools with the nominal size, number of threads per inch, and the proper symbol to identify the thread form.

Symbols commonly used in American practice are:

N. C., indicating American National Coarse Thread Series.
N. F., indicating American National Fine Thread Series.
N., indicating American National 8, 12 and 16 pitch Series.
N. S., indicating American National Special Thread Series.
N. H., indicating American National Hose Coupling Threads.
N. P. T., indicating American National Taper Pipe Threads.
N. P. S., indicating American National Straight Pipe Threads.
GREASE, indicating a standardized undersize straight pipe thread for grease cup fittings.
STEAM, indicating a straight pipe thread used on coupling taps.
CONDUIT, indicating an oversize straight pipe thread used on coupling taps.
V, indicating a 60 degree V thread usually with both the crest and root flatted several thousandths from the theoretical to the user's specifications.
ACME, indicating a standardized 29 degree thread.
S. B., indicating manufacturers stove bolt standard thread.

Such markings as U.S.S., U.S.F., S.A.E., and A.S.M.E. are now obsolete.

2. Bent Shank Tapper Taps.

In addition to the regular marking bent shank tapper taps when made to Table No. 336 are marked "Class 2." When made to Table No. 337 are marked "Class 3."

3. Special Taps.

Special taps (except ground thread taps marked with a limit number as specified in section No. 4) varying only slightly from standard dimensions are to be marked with the letter "S" enclosed in a circle Ⓢ.

Taps varying on the pitch diameter up to .015″ over or under basic will be marked with the actual amount the low limit is over or under basic size, in addition to the standard size.

Left hand taps will be marked "Left Hand" or "L. H." in addition to the standard marking.

4. Ground Thread Taps.

All commercial ground thread taps made to the thread limits shown in Tables No. 326 and No. 329, will be marked with one ring on the shank near the thread in addition to the standard marking.

All precision ground thread taps made to the thread limits shown in Table No. 327 will be marked with the limit number. Other precision ground thread taps will be marked with the same limit number, as follows:

Taps having a pitch diameter between basic and minus .0005″.. 01
Taps having a pitch diameter between basic and plus .0005″... 1
Taps having a pitch diameter between .0005″ to .0010″ over basic 2

(Concluded on following page)

TABLE 301

Standard System of Marking

(Concluded)

Ground thread pipe taps made to Tables No. 335 and No. 338 will be marked "CG."

Other special ground thread taps will be marked "CG" if the pitch diameter grinding tolerance is equal to or greater than shown below, and will be marked "PG" if it is less.

4 to 5½ threads per inch inclusive	.0020″
6 threads per inch	.0018″
7 threads per inch	.0015″
8 threads per inch	.0014″
9 threads per inch	.0012″
10 and 11½ threads per inch	.0011″
12 threads per inch and finer	.0010″

5. Multiple Thread Taps and Dies.

Taps and dies having multiple thread will be marked with diameter, number of threads to the inch, form of thread and lead designated in fractions; also double, triple or quadruple.

For example: A 1″—16 double thread special tap with National form of thread will be marked as follows:

1″—16 N. S.
⅛″ Lead Double

The same tap with Acme thread will be marked as follows:

1″—16 Acme
⅛″ Lead Double

6. American National Thread Series.

The sizes and pitches included in the American National Coarse Thread Series are as follows:

No. 1—64	No. 12—24	¾″—10	2″ —4½
No. 2—56	¼″—20	⅞″— 9	2¼″—4½
No. 3—48	5/16″—18	1″ — 8	2½″—4
No. 4—40	⅜″—16	1⅛″— 7	2¾″—4
No. 5—40	7/16″—14	1¼″— 7	3″ —4
No. 6—32	½″—13	1⅜″— 6	3¼″—4
No. 8—32	9/16″—12	1½″— 6	3½″—4
No. 10—24	⅝″—11	1¾″— 5	3¾″—4
			4″ —4

The sizes and pitches included in the American National Fine Thread Series are as follows:

No. 0—80	No. 6—40	⅜″—24	7/8″—14
No. 1—72	No. 8—36	7/16″—20	1″ —14
No. 2—64	No. 10—32	½″—20	1⅛″—12
No. 3—56	No. 12—28	9/16″—18	1¼″—12
No. 4—48	¼″—28	⅝″—18	1⅜″—12
No. 5—44	5/16″—24	¾″—16	1½″—12

TABLE 301

Standard System of Marking

(Concluded)

British Thread Forms

In order to conform with British practice, the following markings should be used on taps and dies. The authority for this marking will be found in the British Standards Institute Publication No. 84-1940.

BSW., indicating British Standard Whitworth coarse threads.

BSF., indicating British Standard Fine threads.

BSP., Parallel indicating British Standard Straight Pipe threads.

BSP., Taper indicating British Standard Taper Pipe threads.

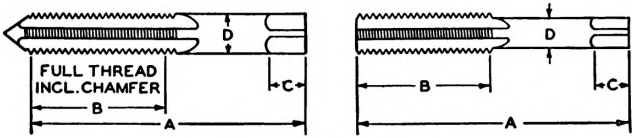
WHIT., indicating Whitworth Standard special threads.

BA., indicating British Association Standard threads.

It is customary for the British to speak of a set of taps as consisting of "taper, second or intermediate and plug," corresponding with the American practice of "taper, plug and bottoming." This difference in meaning should be borne in mind to avoid confusion.

TABLE 302

Hand Taps



General Dimensions

Diameter of Tap Inches	Dimensions—Inches				
	Length Overall A	Length of Full Thread B	Length of Square C	Diameter of Shank D	Size of Square E
1/16	1 5/8	5/16	3/16	.141	.110
3/32	1 3/4	7/16	3/16	.141	.110
1/8	1 15/16	5/8	3/16	.141	.110
5/32	2 1/16	3/4	1/4	.160	.125
3/16	2 3/8	7/8	1/4	.192	.149
7/32	2 3/8	15/16	1/4	.223	.167
1/4	2 1/2	1	9/32	.255	.191
9/32	2 1/2	1	5/16	.286	.214
5/16	2 23/32	1 1/8	5/16	.318	.238
11/32	2 23/32	1 1/8	11/32	.349	.262
3/8	2 15/16	1 1/4	3/8	.381	.286
13/32	3 5/32	1 7/16	13/32	.323	.242
7/16	3 5/32	1 7/16	13/32	.323	.242
15/32	3 5/32	1 7/16	13/32	.354	.265
1/2	3 3/8	1 21/32	7/16	.367	.275
17/32	3 3/8	1 21/32	7/16	.398	.298
9/16	3 19/32	1 21/32	1/2	.429	.322
19/32	3 19/32	1 21/32	1/2	.460	.345
5/8	3 13/16	1 13/16	9/16	.480	.360
21/32	3 13/16	1 13/16	9/16	.511	.383
11/16	4 1/32	1 13/16	5/8	.542	.406
23/32	4 1/32	1 13/16	5/8	.573	.430
3/4	4 1/4	2	11/16	.590	.442
25/32	4 1/4	2	11/16	.621	.466
13/16	4 15/32	2	11/16	.652	.489
27/32	4 15/32	2	11/16	.684	.513
7/8	4 11/16	2 7/32	3/4	.697	.523
15/16	4 29/32	2 7/32	3/4	.760	.570
1	5 1/8	2 1/2	13/16	.800	.600
1 1/16	5 1/8	2 1/2	13/16	.862	.646
1 1/8	5 7/16	2 9/16	7/8	.896	.672
1 3/16	5 7/16	2 9/16	7/8	.959	.719

(Continued on following page)

TABLE 302
Hand Taps
(Continued)
General Dimensions

Diameter of Tap Inches	Dimensions—Inches				
	Length Overall A	Length of Full Thread B	Length of Square C	Diameter of Shank D	Size of Square E
1 1/4	5 3/4	2 9/16	1	1.021	.766
1 5/16	5 3/4	2 9/16	1	1.084	.813
1 3/8	6 1/16	3	1 1/16	1.108	.831
1 7/16	6 1/16	3	1 1/16	1.171	.878
1 1/2	6 3/8	3	1 1/8	1.233	.925
1 5/8	6 11/16	3 3/16	1 1/8	1.305	.979
1 3/4	7	3 3/16	1 1/4	1.430	1.072
1 7/8	7 5/16	3 9/16	1 1/4	1.519	1.139
2	7 5/8	3 9/16	1 3/8	1.644	1.233
2 1/8	8	3 9/16	1 3/8	1.769	1.327
2 1/4	8 1/4	3 9/16	1 7/16	1.894	1.420
2 3/8	8 1/2	4	1 7/16	2.019	1.514
2 1/2	8 3/4	4	1 1/2	2.100	1.575
2 5/8	8 3/4	4	1 1/2	2.225	1.669
2 3/4	9 1/4	4	1 9/16	2.350	1.762
2 7/8	9 1/4	4	1 9/16	2.475	1.856
3	9 3/4	4 9/16	1 5/8	2.543	1.907
3 1/8	9 3/4	4 9/16	1 5/8	2.668	2.001
3 1/4	10	4 9/16	1 3/4	2.793	2.095
3 3/8	10	4 9/16	1 3/4	2.883	2.162
3 1/2	10 1/4	4 15/16	2	3.008	2.256
3 5/8	10 1/4	4 15/16	2	3.133	2.350
3 3/4	10 1/2	5 5/16	2 1/8	3.217	2.413
3 7/8	10 1/2	5 5/16	2 1/8	3.342	2.506
4	10 3/4	5 5/16	2 1/4	3.467	2.600

Special Taps

Unless otherwise specified:

Fine pitch hand taps 1⅛″ diameter and larger will be made to Table 303.

Use Table 304 for special hand taps under ¼″ diameter whose nominal diameter is not listed in this table.

All special hand taps ¼″ diameter and over, whose nominal diameter is more than .010″ over the diameter of any size listed in this table, will be furnished with the length, shank and square dimensions of the next larger size tap.

Special cut and ground thread taps will be made to limits shown in Tables 330 and 331.

(Concluded on following page)

TABLE 302

Hand Taps

(Concluded)

Tolerances

Element	Range	Direction	Tolerance	
			Cut Thread	Ground Thread
Length Overall—A	1/16″ to 1″ incl.	Plus or Minus	1/32″	1/32″
	1 1/16″ to 4″ incl.	Plus or Minus	1/16″	1/16″
Length of Thread—B	1/16″ to 7/32″ incl.	Plus or Minus	3/64″	3/64″
	1/4″ to 1/2″ incl.	Plus or Minus	1/16″	1/16″
	9/16″ to 1 1/2″ incl.	Plus or Minus	3/32″	3/32″
	1 5/8″ to 4″ incl.	Plus or Minus	1/8″	1/8″
Length of Square—C	1/16″ to 1″ incl.	Plus or Minus	1/32″	1/32″
	1 1/16″ to 4″ incl.	Plus or Minus	1/16″	1/16″
Diameter of Shank—D	1/16″ to 7/32″ incl.	Minus	.004″	.0015″
	1/4″ to 5/8″ incl.	Minus	.005″	.0015″
	11/16″ to 1″ incl.	Minus	.005″	.002″
	1 1/16″ to 1 1/2″ incl.	Minus	.007″	.002″
	1 5/8″ to 2″ incl.	Minus	.007″	.003″
	2 1/8″ to 4″ incl.	Minus	.009″	.003″
Size of Square—E	1/16″ to 1/2″ incl.	Minus	.004″	.004″
	9/16″ to 1″ incl.	Minus	.006″	.006″
	1 1/16″ to 2″ incl.	Minus	.008″	.008″
	2 1/8″ to 4″ incl.	Minus	.010″	.010″

Formulae

(Approximate)

Diameter of Shank

- **Large Shanks** { 1/16″ to 1/8″ Incl. = Diameter of Shank of 1/8″ Tap. / 5/32″ and Larger = Approximate Maximum Major Diam.
- **Small Shanks** = Basic Major Diameter—(Std. V Pitch x 1.6 to nearest .001″).

Size of Square

{ 1/16″ to 3/16″ = Diameter of Shank x .78 to nearest .001″. / 7/32″ and Larger = Diameter of Shank x .75 to nearest .001″.

Notes

Cut thread taps sizes smaller than 11/32″ have external center on thread end; sizes 11/32″ and larger have internal center in thread end.

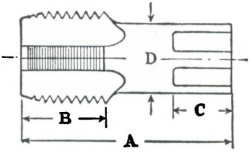
Ground thread taps sizes smaller than 1/4″ have external center on thread end; sizes 1/4″ and larger have internal center in thread end.

Exception: All taps to 3/8″ inclusive having two flutes, three flutes or spiral point have external center on thread end.

For standard thread limits and tolerances see Tables 325, 326 and 327.

TABLE 303

Special Fine Pitch Hand Taps



Unless otherwise specified, orders covering special hand taps 1⅛" to 1½" diameter inclusive having 14 or more threads per inch, and sizes over 1½" diameter with 10 or more threads per inch, will be filled with taps having general dimensions as shown in the following table:

General Dimensions

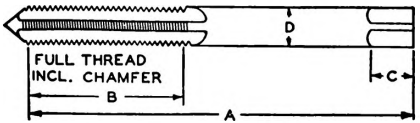
Diameter of Tap Inches	Dimensions—Inches				
	Length Overall A	Length of Full Thread B	Length of Square C	Diameter of Shank D	Size of Square E
1⅛	4	1½	⅞	.896	.672
1¼	4	1½	1	1.021	.766
1⅜	4	1½	1	1.108	.831
1½	4	1½	1	1.233	.925
1⅝	5	2	1⅛	1.305	.979
1¾	5	2	1¼	1.430	1.072
1⅞	5	2	1¼	1.519	1.139
2	5	2	1⅜	1.644	1.233
2⅛	5¼	2	1⅜	1.769	1.327
2¼	5¼	2	1⅞16	1.894	1.420
2⅜	5¼	2	1⅞16	2.019	1.514
2½	5¼	2	1½	2.100	1.575
2⅝	5½	2	1½	2.100	1.575
2¾	5½	2	1½	2.100	1.575
2⅞	5½	2	1½	2.100	1.575
3	5½	2	1½	2.100	1.575
3⅛	5¾	2	1½	2.100	1.575
3¼	5¾	2	1½	2.100	1.575
3⅜	5¾	2	1½	2.100	1.575
3½	5¾	2	1½	2.100	1.575
3⅝	6	2	1¾	2.100	1.575
3¾	6	2	1¾	2.100	1.575
3⅞	6	2	1¾	2.100	1.575
4	6	2	1¾	2.100	1.575

Notes

For tolerances see Table 302.
For standard thread limits and tolerances see Tables 330 and 331.

TABLE 304

Machine Screw Taps



General Dimensions

Screw Gage No.	Dimensions—Inches						
	Length Overall A		Length of Full Thd. B		Length of Square C	Diam. of Shank D	Size of Square E
	Standard	Stub	Standard	Stub			
0	1 5/8	...	5/16	..	3/16	.141	.110
1	1 11/16	...	3/8	..	3/16	.141	.110
2	1 3/4	1 3/4	7/16	5/16	3/16	.141	.110
3	1 13/16	1 3/4	1/2	3/8	3/16	.141	.110
4	1 7/8	1 3/4	9/16	7/16	3/16	.141	.110
5	1 15/16	1 3/4	5/8	7/16	3/16	.141	.110
6	2	1 3/4	11/16	1/2	3/16	.141	.110
7	2 1/16	...	3/4	..	1/4	.168	.131
8	2 1/8	1 3/4	3/4	9/16	1/4	.168	.131
9	2 1/4	...	13/16	..	1/4	.194	.152
10	2 3/8	1 3/4	7/8	5/8	1/4	.194	.152
12	2 3/8	1 3/4	15/16	11/16	5/32	.220	.165
14	2 1/2	...	1	..	5/32	.247	.185
16	2 1/2	...	1 1/16	..	5/16	.273	.205
18	2 29/32	...	1 1/16	..	5/16	.299	.225
20	2 29/32	...	1 1/8	..	11/32	.325	.244

Tolerances

Element	Range Screw Gage No.	Direction	Tolerance	
			Cut Thread	Ground Thread
Length Overall—A	0 to 20 incl.	Plus or Minus	1/32"	1/32"
Length of Thread—B	0 to 12 incl.	Plus or Minus	3/64"	3/64"
	14 to 20 incl.	Plus or Minus	1/16"	1/16"
Length of Square—C	0 to 20 incl.	Plus or Minus	1/32"	1/32"
Diameter of Shank—D	0 to 12 incl.	Minus	.004"	.0015"
	14 to 20 incl.	Minus	.005"	.0015"
Size of Square—E	0 to 20 incl.	Minus	.004"	.004"

Formulae

(Approximate)

Diameter of Shank { No. 0 to No. 5 Incl. = Diameter of Shank of No. 6 Tap.
No. 6 to No. 20 Incl. = Approximate Maximum Major Diameter (except No. 7 and No. 9).

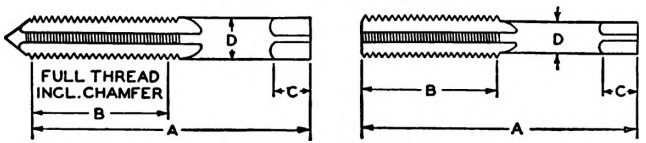
Size of Square { No. 0 to No. 10 Incl. = Diam. of Shank x .78 to nearest .001".
No. 12 to No. 20 Incl. = Diam. of Shank x .75 to nearest .001".

Notes

All taps have external center on thread end.
For standard thread limits and tolerances see Tables 328 and 329.

TABLE 305

Stove Bolt Taps



General Dimensions

Nominal Size of Tap	Length Inches					
	Overall A	Full Thread B	Square C	Diameter of Shank D	Size of Square E	Corresponding Size Standard Tap Blank
1/8–32	1 15/16	5/8	3/16	.141	.110	..
5/32–28	2 1/8	3/4	1/4	.168	.131	No. 8 M. S.
5/16–24	2 3/8	7/8	1/4	.201	.151	..
7/32–22	2 3/8	15/16	1/4	.228	.171	..
1/4–18	2 1/2	1	5/32	.255	.191	1/4
5/16–18	2 25/32	1 1/8	5/16	.318	.238	5/16
3/8–16	2 15/16	1 1/4	3/8	.381	.286	3/8
7/16–14	3 5/32	1 7/16	13/32	.323	.242	7/16
1/2–13	3 3/8	1 21/32	7/16	.367	.275	1/2

Tolerances

Element	Range	Direction	Tolerance
Length Overall—A	1/8″ to 1/2″ incl.	Plus or Minus	1/32″
Length of Thread—B	1/8″ to 7/32″ incl. 1/4″ to 1/2″ incl.	Plus or Minus Plus or Minus	3/64″ 1/16″
Length of Square—C	1/8″ to 1/2″ incl.	Plus or Minus	1/32″
Diameter of Shank—D	1/8″ to 7/32″ incl. 1/4″ to 1/2″ incl.	Minus Minus	.004″ .005″
Size of Square—E	1/8″ to 1/2″ incl.	Minus	.004″

Formulae

(Approximate)

Diameter of Shank
- Large Shanks
  - 1/8″ = Diameter of Shank of 1/8″ Hand Tap.
  - 5/32″ and Larger = Approximate Maximum Major Diam.
- Small Shanks = Basic Major Diameter—(Std. V Pitch x 1.6 to nearest .001″).

Size of Square
- 1/8″ to 5/32″ Incl. = Diameter of Shank x .78 to nearest .001″.
- 3/16″ and Larger = Diameter of Shank x .75 to nearest .001″.

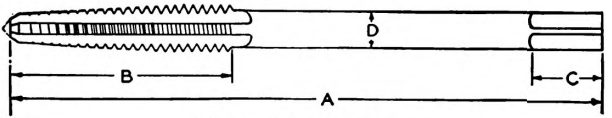
Notes

Cut thread taps up to 5/16″ inclusive have external center on thread end; sizes 3/8″ and larger have internal center in thread end.

For standard thread limits and tolerances see Table 332.

These taps conform to the manufacturers' standard for stove bolts.

TABLE 306
Nut Taps



General Dimensions

Diam. of Tap Inches	Threads per Inch			Dimensions—Inches				
	N. C.	N. F.	N. S.	Length Overall A	Length of Thread B	Length of Square C	Diam. of Shank D	Size of Square E
3/16	..	..	24	4 1/2	1 3/8	1/2	.133	.100
3/16	..	..	32	4 1/2	1	1/2	.133	.100
1/4	20	..	..	5	1 5/8	9/16	.185	.139
1/4	..	28	..	5	1 1/4	9/16	.185	.139
5/16	18	..	..	5 1/2	1 13/16	5/8	.240	.180
5/16	..	24	..	5 1/2	1 3/8	5/8	.240	.180
3/8	16	..	..	6	2	11/16	.294	.220
3/8	..	24	..	6	1 1/2	11/16	.294	.220
7/16	14	..	..	6 1/2	2 3/8	3/4	.345	.259
7/16	..	20	..	6 1/2	1 3/4	3/4	.345	.259
1/2	13	..	..	7	2 1/2	7/8	.400	.300
1/2	..	20	..	7	1 7/8	7/8	.400	.300
9/16	12	..	..	7 1/2	2 3/4	7/8	.450	.337
9/16	..	18	..	7 1/2	2	7/8	.450	.337
5/8	11	..	..	8	3	15/16	.503	.377
5/8	..	18	..	8	2 1/4	15/16	.503	.377
11/16	..	..	11	8 1/2	3	1	.565	.424
11/16	..	..	16	8 1/2	2 1/4	1	.565	.424
3/4	10	..	..	9	3 1/4	1	.616	.462
3/4	..	16	..	9	2 1/2	1	.616	.462
13/16	..	..	10	9 1/2	3 1/4	1 1/16	.679	.509
7/8	9	..	..	10	3 5/8	1 1/16	.727	.545
7/8	..	14	..	10	2 3/4	1 1/16	.727	.545
7/8	..	..	18	10	2 3/4	1 1/16	.727	.545
15/16	..	..	9	10 1/2	3 5/8	1 1/8	.789	.592
1	8	..	..	11	4	1 1/8	.834	.625
1	..	14	..	11	3	1 1/8	.834	.625
1 1/8	7	..	..	11 1/2	4 3/4	1 1/4	.933	.700
1 1/8	..	12	..	11 1/2	3 1/2	1 1/4	.933	.700
1 1/4	7	..	..	12	4 3/4	1 5/16	1.058	.793
1 1/4	..	12	..	12	3 1/2	1 5/16	1.058	.793
1 3/8	6	..	..	12 1/2	5 3/8	1 3/8	1.153	.865
1 3/8	..	12	..	12 1/2	4	1 3/8	1.153	.865
1 1/2	6	..	..	13	5 3/8	1 1/2	1.278	.958
1 1/2	..	12	..	13	4	1 1/2	1.278	.958

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TABLE 306

Nut Taps

(Concluded)

General Dimensions

Diam. of Tap Inches	Threads per Inch			Dimensions—Inches				
	N. C.	N. F.	N. S.	Length Over-all A	Length of Thread B	Length of Square C	Diameter of Shank D	Size of Square E
1 3/8	...	...	5 1/2	13 1/2	5 1/2	1 9/16	1.383	1.037
1 3/4	5	...	...	14	5 1/2	1 5/8	1.484	1.113
1 7/8	...	...	5	14 1/2	5 1/2	1 11/16	1.609	1.207
2	4 1/2	...	...	15	6 1/8	1 3/4	1.705	1.279
2 1/8	...	...	4 1/2	15 1/2	6 1/8	1 13/16	1.828	1.371
2 1/4	4 1/2	...	...	16	6 1/8	1 7/8	1.953	1.465
2 3/8	...	...	4	16 1/2	6 7/8	2	2.042	1.531
2 1/2	4	...	...	17	6 7/8	2	2.167	1.625

Tolerances

Element	Range	Direction	Tolerance	
			Cut Thread	Ground Thread
Length Overall—A	3/16″ to 1″ incl. 1 1/8″ to 2 1/2″ incl.	Plus or Minus Plus or Minus	1/16″ 3/32″	1/16″ 3/32″
Length of Thread—B	3/16″ to 1/2″ incl. 9/16″ to 1 1/2″ incl. 1 5/8″ to 2 1/2″ incl.	Plus or Minus Plus or Minus Plus or Minus	1/16″ 3/32″ 1/8″	1/16″ 3/32″ 1/8″
Length of Square—C	3/16″ to 5/8″ incl. 11/16″ to 1 1/4″ incl. 1 5/8″ to 2 1/2″ incl.	Plus or Minus Plus or Minus Plus or Minus	1/32″ 3/64″ 1/16″	1/32″ 3/64″ 1/16″
Diameter of Shank—D	3/16″ to 1/2″ incl. 9/16″ to 1″ incl. 1 1/8″ to 2″ incl. 2 1/8″ to 2 1/2″ incl.	Minus Minus Minus Minus	.005″ .006″ .008″ .010″	.005″ .006″ .008″ .010″
Size of Square—E	3/16″ to 1/2″ incl. 9/16″ to 1″ incl. 1 1/8″ to 2″ incl. 2 1/8″ to 2 1/2″ incl.	Minus Minus Minus Minus	.004″ .006″ .008″ .010″	.004″ .006″ .008″ .010″

Formulae

(Approximate)

Diam. of Shank

3/16″ to 1/2″ Incl. = N. C. Basic Root Diam.
9/16″ to 1″ Incl. = N. C. Basic Root Diam. Minus .004″.
1 1/8″ to 2″ Incl. = N. C. Basic Root Diam. Minus .006″.
2 1/8″ to 2 1/2″ Incl. = N. C. Basic Root Diam. Minus .008″.

Size of Square = Diameter of Shank x .75 to nearest .001″.

Notes

Cut thread taps up to 13/32″ inclusive have external center on thread end; sizes 1/16″ and larger have internal center in thread end.

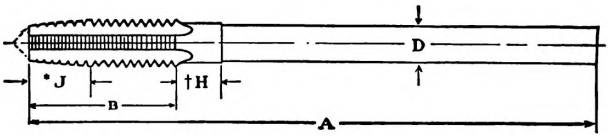
Ground thread taps up to 15/64″ inclusive have external center on thread end; sizes 1/4″ and larger have internal center in thread end.

For standard thread limits and tolerances see Tables 325 and 326.

TABLE 307

Tapper Taps

Fractional Sizes



General Dimensions

Diam. of Tap Inches	Threads per Inch			Dimensions—Inches			
	N. C.	N. F.	N. S.	Length Over-all A	Length of Thread B	Diam. of Shank D	Nut Guide H
1/4	20	..	..	12	1 1/4	.185	..
1/4	..	28	..	12	1	.185	1/4
5/16	18	..	..	12	1 3/8	.240	..
5/16	..	24	..	12	1 1/16	.240	5/16
3/8	16	..	..	12	1 9/16	.294	..
3/8	..	24	..	12	1 3/16	.294	3/8
7/16	14	..	..	12	1 13/16	.345	..
7/16	..	20	..	12	1 3/8	.345	7/16
1/2	13	..	..	12 and 15	1 7/8	.400	..
1/2	..	20	..	12 and 15	1 3/8	.400	1/2
9/16	12	..	..	12 and 15	2 1/8	.450	..
9/16	..	18	..	12 and 15	1 9/16	.450	9/16
5/8	11	..	..	12 and 15	2 5/16	.503	..
5/8	..	18	..	12 and 15	1 11/16	.503	5/8
11/16	..	..	11	12 and 15	2 5/16	.565	..
11/16	..	..	16	12 and 15	1 11/16	.565	5/8
3/4	10	..	..	12 and 15	2 1/2	.616	..
3/4	..	16	..	12 and 15	1 3/4	.616	3/4
13/16	..	..	10	12 and 15	2 1/2	.679	..
7/8	9	..	..	12 and 15	2 3/4	.727	..
7/8	..	14	..	12 and 15	1 7/8	.727	7/8
7/8	..	..	18	12 and 15	1 7/8	.727	7/8
15/16	..	..	9	12 and 15	2 3/4	.789	..
1	8	..	..	12 and 15	3 1/8	.834	..
1	..	14	..	12 and 15	2 1/8	.834	1

(Concluded on following page)

TABLE 307

Tapper Taps

Fractional Sizes
(Concluded)

General Dimensions

Diameter of Tap Inches	Threads per Inch			Dimensions—Inches			
	N. C.	N. F.	N. S.	Length Over-all A	Length of Thread B	Diameter of Shank D	Nut Guide H
1⅛	7	..	...	15	3½	.933	...
1⅛	...	12	...	15	2⅝	.933	1⅛
1¼	7	..	...	15	3½	1.058	...
1¼	...	12	...	15	2⅝	1.058	1⅛
1⅜	6	..	...	15	4	1.153	...
1⅜	...	12	...	15	2⅝	1.153	1⅜
1½	6	..	...	15	4	1.278	...
1½	...	12	...	15	2⅝	1.278	1⅜
1⅝	...	..	5½	15	4	1.383	...
1¾	5	..	...	15	4½	1.484	...
1⅞	...	..	5	15	4½	1.609	...
2	4½	..	...	15	4½	1.705	..

Tolerances

Element	Range	Direction	Tolerance	
			Cut Thread	Ground Thread
Length Overall—A	¼″ to 1″ incl. 1⅛″ to 2″ incl.	Plus or Minus Plus or Minus	1/16″ 5/16″	1/16″ 5/16″
Length of Thread—B	¼″ to ½″ incl. 9/16″ to 1½″ incl. 1⅝″ to 2″ incl.	Plus or Minus Plus or Minus Plus or Minus	1/16″ 3/32″ 1/8″	1/16″ 3/32″ 1/8″
Diameter of Shank—D	¼″ to ½″ incl. 9/16″ to 1″ incl. 1⅛″ to 2″ incl.	Minus Minus Minus	.005″ .006″ .008″	.005″ .006″ .008″

Formulae
(Approximate)

Diam. of Shank
- ¼″ to ½″ Incl. = N. C. Basic Root Diameter.
- 9/16″ to 1″ Incl. = N. C. Basic Root Diam. Minus .004″.
- 1⅛″ to 2″ Incl. = N. C. Basic Root Diam. Minus .006″.

Notes

A nut guide "H," approximately equal in diameter to the basic root diameter, may be furnished on taps having threads N. F. and finer.

*The chamfer "J" is 11 to 12 threads for National Coarse Thread taps and 15 to 17 threads for National Fine Thread taps.

Cut thread taps up to 13/32″ inclusive have external center on thread end; sizes 7/16″ and larger have internal center in thread end.

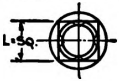
Ground thread taps have internal center in thread end.

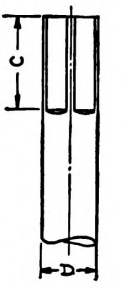
Tapper taps are furnished with plain round shank unless otherwise ordered. For other styles of shanks see Table 308.

For standard thread limits and tolerances see Tables 325 and 326.

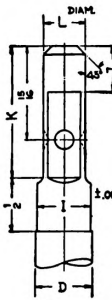
TABLE 308

Tapper Tap Shanks

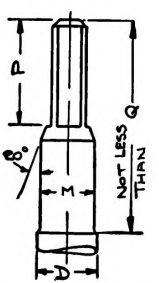




Plain Round or Squared



Acme Improved Type "C"



National Interchangeable Ring Lock

General Dimensions

Diam. of Tap Inches	Dimensions—Inches										
	C	D	E	I	K	L	M	N	O	P	Q
1/4	9/16	.185	.139	.177	15/16	.147	.185	.170	.134	11/16	2 1/2
5/16	5/8	.240	.180	.232	15/16	.188	.240	.221	.165	11/16	2 1/2
3/8	11/16	.294	.220	.286	15/16	.240	.290	.271	.208	11/16	2 1/2
7/16	3/4	.345	.259	.336	15/16	.290	.340	.320	.240	11/16	2 1/2
1/2	7/8	.400	.300	.390	15/16	.320	.400	.374	.286	1	3 1/4
9/16	7/8	.450	.337	.446	15/16	.350	.450	.422	.318	1	3 1/4
5/8	15/16	.503	.377	.500	15/16	.390	.500	.450	.350	1	3 1/4
11/16	1	.565	.424	.554	15/16	.430	.565	.515	.390	1 5/16	3 3/4
3/4	1	.616	.462	.610	15/16	.480	.615	.540	.422	1 5/16	3 3/4
13/16	1 1/16	.679	.509	.659	15/16	.540	.675	.620	.465	1 5/16	3 3/4
7/8	1 1/16	.727	.545	.722	15/16	.540	.720	.630	.500	1 5/16	3 3/4
15/16	1 1/8	.789	.592	.774	15/16	.580	.785	.727	.545	1 5/16	3 3/4
1	1 1/8	.834	.625	.829	15/8	.650	.825	.730	.574	1 5/16	3 3/4
1 1/8	1 1/4	.933	.700	.929	15/8	.710	.930	.855	.667	1 3/4	4 1/2
1 1/4	1 5/16	1.058	.793	1.053	15/8	.780	1.055	.975	.760	1 3/4	4 1/2
1 3/8	1 3/8	1.153	.865	1.149	15/8	.850	1.150	1.055	.824	1 3/4	4 1/2
1 1/2	1 1/2	1.278	.958	1.269	15/8	.950	1.275	1.195	.917	1 3/4	4 1/2
1 5/8	1 9/16	1.383	1.037	1.328	15/8	1.000	1.375	1.319	.995	2 1/16	4 3/4
1 3/4	1 5/8	1.484	1.113	1.436	15/8	1.062	1.480	1.421	1.070	2 1/16	4 3/4
1 7/8	1 11/16	1.609	1.207	1.594	15/8	1.187	1.605	1.548	1.167	2 1/16	4 3/4
2	1 3/4	1.705	1.279	1.696	15/8	1.250	1.700	1.641	1.230	2 1/16	4 3/4

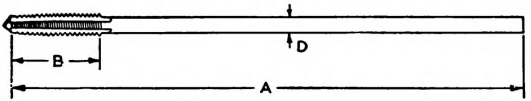
Note

For tolerances on size of squares see Table 306.

TABLE 309

Tapper Taps

Machine Screw Sizes



General Dimensions

Screw Gage No.	Threads per Inch			Dimensions—Inches		
	N.C.	N.F.	N.S.	Length Over-all A	Length of Thread B	Diameter of Shank D
2	56	..	..	5	11/32	.063
2	..	64	..	5	5/16	.066
3	48	..	..	5	13/32	.072
3	..	56	..	5	11/32	.076
4	..	..	36	6	9/16	.076
4	40	..	..	6	1/2	.080
4	..	48	..	6	13/32	.085
5	40	..	..	8	1/2	.093
5	..	44	..	8	7/16	.096
6	32	..	..	8	5/8	.097
6	..	40	..	8	1/2	.106
8	32	..	..	9	5/8	.123
8	..	36	..	9	9/16	.128
10	24	..	..	11	13/16	.136
10	..	32	..	11	5/8	.149
12	24	..	..	11	13/16	.162
12	..	28	..	11	23/32	.170
14	..	..	20	11	1	.177
14	..	..	24	11	13/16	.188

Tolerances

Element	Range	Direction	Tolerance
Length Overall (A)	Sizes 2 to 14 incl.	Plus or Minus	1/16"
Length of Thread (B)	Sizes 2 to 14 incl.	Plus or Minus	3/64"
Diameter of Shank (D)	Sizes 2 to 14 incl.	Minus	.005"

Formulae

(Approximate)

Diameter of Shank = National Basic Root Diameter to nearest .001".

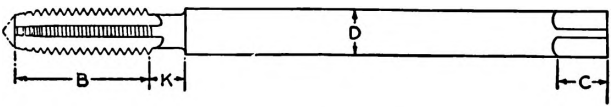
Notes

For standard thread limits and tolerances see Table 328.

The chamfer is 11 to 12 threads.

TABLE 310

Pulley Taps



General Dimensions

Diameter of Tap Inches	Dimensions—Inches					
	Length Overall A	Length of Thread B	Length of Square C	Diameter of Shank D	Size of Square E	Length of Neck K
1/4	6, 8	1	5/16	.255	.191	3/8
5/16	6, 8	1 1/8	3/8	.318	.238	3/8
3/8	6, 8, 10	1 1/4	7/16	.381	.286	3/8
7/16	6, 8, 10, 12	1 7/16	1/2	.444	.333	7/16
1/2	6, 8, 10, 12	1 21/32	9/16	.507	.380	1/2
5/8	6, 8, 10, 12, 14	1 13/16	11/16	.633	.475	5/8
3/4	10, 12, 14	2	3/4	.759	.569	3/4

Tolerances

Element	Range	Direction	Tolerance	
			Cut Thread	Ground Thread
Length Overall—A	1/4" to 3/4" incl.	Plus or Minus	1/16"	1/16"
Length of Thread—B	1/4" to 3/4" incl.	Plus or Minus	1/16"	1/16"
Length of Square—C	1/4" to 3/4" incl.	Plus or Minus	1/32"	1/32"
Diameter of Shank—D	1/4" to 3/4" incl.	Minus	.005"	.005"
Size of Square—E	1/4" to 1/2" incl.	Minus	.004"	.004"
	5/8" to 3/4" incl.	Minus	.006"	.006"

Formulae

(Approximate)

Diameter of Shank = Maximum Major Diameter.

Size of Square = Diameter of Shank x .75 to nearest .001".

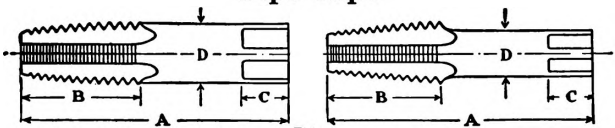
Notes

Cut thread taps up to 5/16" have external center on thread end; sizes 3/8" and larger have internal center in thread end.

Ground thread taps have internal center in thread end.

For standard thread limits and tolerances see Tables 325 and 326.

TABLE 311
Pipe Taps



General Dimensions

Nominal Size Inches	Dimensions—Inches				
	Length Overall A	Length of Thread B	Length of Square C	Diameter of Shank D	Size of Square E
1/8	2 1/8	3/4	3/8	.3125	.234
1/4	2 1/4	3/4	3/8	.4375	.328
3/8	2 7/16	1 1/16	7/16	.5625	.421
1/2	2 9/16	1 1/16	1/2	.7000	.531
5/8	3 1/16	1 5/16	5/8	.6875	.515
3/4	3 3/16	1 5/16	5/8	.8125	.594
7/8	3 1/4	1 5/16	11/16	.9063	.679
1	3 1/2	1 9/16	3/4	1.0937	.812
1 1/4	3 3/4	1 3/4	15/16	1.1250	.843
1 1/2	4	1 3/4	15/16	1.3125	.984
1 3/4	4 1/4	1 3/4	1	1.5000	1.125
2	4 3/8	1 3/4	1 1/16	1.6250	1.218
2 1/4	4 1/2	1 3/4	1 1/8	1.8750	1.406
2 1/2	5	2 1/8	1 5/16	2.0000	1.500
2 3/4	5 1/2	2 5/16	1 1/4	2.2500	1.687
3	5 3/4	2 5/16	1 5/16	2.3750	1.781
3 1/4	6	2 5/8	1 3/8	2.6250	1.968
3 1/2	6 1/4	2 5/8	1 7/16	2.7500	2.062
3 3/4	6 1/2	2 11/16	1 1/2	2.8125	2.108
4	6 5/8	2 11/16	1 9/16	2.8750	2.156
	6 3/4	2 3/4	1 5/8	3.0000	2.250

Tolerances

Element	Range	Direction	Tolerance	
			Cut Thread	Ground Thread
Length Overall—A	1/8" to 3/4" incl. 7/8" to 4" incl.	Plus or Minus Plus or Minus	1/32" 1/16"	1/32" 1/16"
Length of Thread—B	1/8" to 3/4" incl. 7/8" to 1 1/4" incl. 1 1/2" to 4" incl.	Plus or Minus Plus or Minus Plus or Minus	1/16" 3/32" 1/8"	1/16" 3/32" 1/8"
Length of Square—C	1/8" to 3/4" incl. 7/8" to 4" incl.	Plus or Minus Plus or Minus	1/32" 1/16"	1/32" 1/16"
Diameter of Shank—D	1/8" to 1/2" incl. 5/8" to 4" incl.	Minus Minus	.007" .009"	.007" .009"
Size of Square—E	1/8" 1/4" to 3/4" incl. 7/8" to 4" incl.	Minus Minus Minus	.004" .006" .008"	.004" .006" .008"

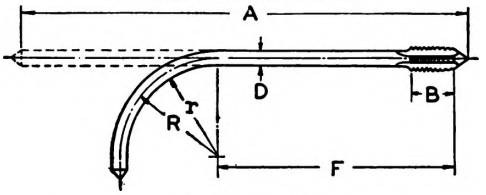
Note

For standard thread limits and tolerances see Tables 334, 335 and 338.

TABLE 312

Bent Shank Tapper Taps

Machine Screw Sizes



General Dimensions

Screw Gage No.	Basic Major Diam. Inches	Size of Mach.	Threads per Inch N.C.	N.F.	N.S.	No. Flutes of	Dimensions—Inches A	B	D	F	R	r
4	.112	1/8"	..	..	36	3	3 9/16	11/32	.076	1 25/32	7/8	.837
4	.112	1/8"	40	..	..	3	3 9/16	5/16	.080	1 25/32	7/8	.836
4	.112	1/8"	..	48	..	3	3 9/16	1/4	.085	1 25/32	7/8	.832
5	.125	1/8"	40	..	..	3	3 9/16	5/16	.093	1 25/32	7/8	.829
5	.125	1/8"	..	44	..	3	3 9/16	9/32	.095	1 25/32	7/8	.827
6	.138	1/8"	32	..	..	3	3 9/16	5/16	.095	1 25/32	7/8	.827
6	.138	1/8"	..	40	..	3	3 9/16	5/16	.104	1 25/32	7/8	.823
6	.138	5/16"	32	..	..	3	4 15/16	5/16	.095	2 15/32	1 5/16	1.140
6	.138	5/16"	..	40	..	3	4 15/16	5/16	.104	2 15/32	1 5/16	1.136
8	.164	5/16"	32	..	..	3	4 15/16	5/16	.121	2 7/16	1 5/16	1.127
8	.164	5/16"	..	36	..	3	4 15/16	11/32	.126	2 7/16	1 5/16	1.125
10	.190	5/16"	24	..	..	3	4 15/16	1/2	.134	2 13/32	1 5/16	1.121
10	.190	5/16"	..	32	..	3	4 15/16	5/16	.147	2 13/32	1 5/16	1.114
12	.216	5/16"	24	..	..	3	4 15/16	1/2	.157	2 9/16	1 5/16	1.109
12	.216	5/16"	..	28	..	3	4 15/16	7/16	.165	2 9/16	1 5/16	1.105
6	.138	1/4"	32	..	..	3	6 1/2	5/16	.095	3 25/32	1 1/4	1.202
6	.138	1/4"	..	40	..	3	6 1/2	5/16	.104	3 25/32	1 1/4	1.198
8	.164	1/4"	32	..	..	3	6 1/2	5/16	.121	3 3/4	1 1/4	1.190
8	.164	1/4"	..	36	..	3	6 1/2	11/32	.126	3 3/4	1 1/4	1.187
10	.190	1/4"	24	..	..	3	6 1/2	1/2	.134	3 23/32	1 1/4	1.183
10	.190	1/4"	..	32	..	3	6 1/2	5/16	.147	3 23/32	1 1/4	1.176
12	.216	1/4"	24	..	..	3	6 1/2	1/2	.157	3 11/16	1 1/4	1.171
12	.216	1/4"	..	28	..	3	6 1/2	7/16	.165	3 11/16	1 1/4	1.167
14	.242	1/4"	..	..	20	3	6 1/2	19/32	.172	3 21/32	1 1/4	1.164
14	.242	1/4"	..	..	24	3	6 1/2	1/2	.183	3 21/32	1 1/4	1.158

Tolerances

Element	Range Screw Gage No.	Direction	Tolerance
Length Overall—A	4 to 14 incl.	Plus	1/8"
Length of Thread—B	4 to 14 incl.	Plus or Minus	3/64"
Diameter of Shank—D	4 to 14 incl.	Minus	.005"

Formulae

(Approximate)

Diameter of Shank
- No. 5 and smaller = National Basic Root Diameter.
- No. 6 to No. 10 incl. = National Basic Root Diameter minus .002".
- No. 12 and larger = National Basic Root Diameter minus .005".

All to nearest .001".

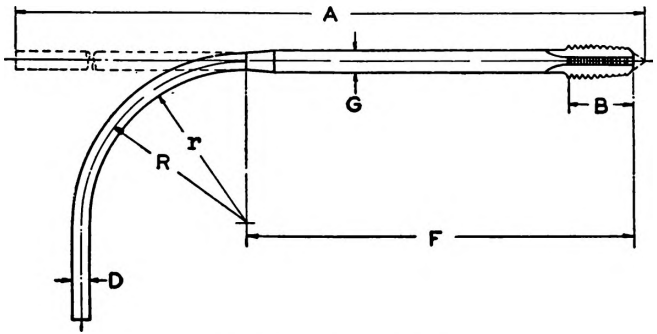
Notes

All taps have external center on thread end.
For standard thread limits and tolerances see Table 328.

TABLE 313

Bent Shank Tapper Taps

Fractional Sizes



General Dimensions

Diam. of Tap Inches	Size of Mach.	Threads per Inch N.C.	N.F.	N.S.	S.B.	No. of Flutes	Dimensions—Inches A	B	D	F	G	R	r
5/32	3/16"	..	..	..	28	3	4 15/16	7/16	.128	2 7/16	..	1 3/16	1.124
3/16	3/16"	..	..	..	24	3	4 15/16	1/2	.153	2 7/16	..	1 3/16	1.111
1/8	1/4"	..	..	40	..	3	6 1/2	5/16	.093	3 3/4	..	1 1/4	1.204
5/32	1/4"	..	..	..	28	3	6 1/2	7/16	.128	3 3/4	..	1 1/4	1.186
3/16	1/4"	..	..	24	..	3	6 1/2	1/2	.133	3 3/4	..	1 1/4	1.183
3/16	1/4"	..	..	32	..	3	6 1/2	5/8	.147	3 3/4	..	1 1/4	1.176
3/16	1/4"	..	..	..	24	3	6 1/2	1/2	.153	3 3/4	..	1 1/4	1.174
1/4	1/4"	20	..	..	..	3	6 1/2	5/8	.180	3 21/32	..	1 1/4	1.160
1/4	1/4"	..	28	..	..	3	6 1/2	5/8	.194	3 5/8	..	1 1/4	1.153
1/4	1/4"	..	..	..	18	3	6 1/2	11/16	.200	3 11/16	..	1 1/4	1.150
5/16	1/4"	18	..	..	..	3	6 1/2	11/16	.235	3 5/8	..	1 1/4	1.133
5/16	1/4"	..	24	..	..	3	6 1/2	5/8	.245	3 5/8	..	1 1/4	1.128
1/4		20	..	..	..	3	8 3/4	5/8	.180	4 17/32	..	1 7/8	1.785
1/4	5/16"	..	28	..	..	3	8 3/4	5/8	.194	4 1/2	..	1 7/8	1.778
5/16	5/16"	18	..	..	..	3	8 3/4	3/4	.235	4 15/32	..	1 7/8	1.757
5/16	5/16"	..	24	..	..	3	8 3/4	3/4	.245	4 5/16	..	1 7/8	1.752
3/8	5/16"	16	..	..	..	3	8 3/4	3/4	.289	4 13/32	..	1 7/8	1.730
3/8	5/16"	..	24	..	..	3	8 3/4	3/4	.289	4 5/8	.321	1 7/8	1.723
3/8	1/2"	16	..	..	..	3	12	13/16	.289	5 29/32	..	2 1/2	2.355
3/8	1/2"	..	24	..	..	3	12	3/4	.289	5 7/8	.321	2 1/2	2.348
7/16	1/2"	14	..	..	..	3	12	1 5/16	.340	6 1/32	..	2 1/2	2.330
7/16	1/2"	..	20	..	..	3	12	1 1/16	.340	6 1/16	.373	2 1/2	2.330
1/2	1/2"	13	..	..	..	3	12	1 5/16	.395	6 1/16	..	2 1/2	2.302
1/2	1/2"	..	20	..	..	3	12	1 1/16	.395	6 1/32	.435	2 1/2	2.302

(Concluded on following page)

TABLE 313

Bent Shank Tapper Taps

Fractional Sizes

(Concluded)

General Dimensions

Diam. of Tap Inches	Size of Mach.	Threads per Inch N.C.	N.F.	N.S.	S.B.	No. of Flutes	Dimensions—Inches A	B	D	F	G	R	r
9/16	5/8"	12	..	..	..	3	15	1 7/16	.449	7 9/32	..	3 3/4	3.525
9/16	5/8"	..	18	..	..	3	15	1 5/16	.449	7 1/4	.490	3 3/4	3.525
5/8	5/8"	11	..	..	..	3	15	1 5/8	.502	7 1/4	..	3 3/4	3.499
5/8	5/8"	..	18	..	..	3	15	1 5/16	.502	7 1/4	.553	3 3/4	3.499
3/4	5/8"	*10	..	..	..	3	15	1 13/16	.605	7 5/16	..	3 3/4	3.447
3/4	5/8"	..	16	..	..	3	15	1 5/8	.605	7 5/16	.669	3 3/4	3.447
3/4	7/8"	10	..	..	..	3	18 7/16	1 13/16	.605	8 1/2	..	4 1/2	4.197
3/4	7/8"	..	16	..	..	3	18 7/16	1 5/8	.605	8 1/2	.669	4 1/2	4.197
7/8	7/8"	9	..	..	..	3	18 7/16	1 15/16	.716	8 7/16	..	4 1/2	4.142
7/8	7/8"	..	14	..	..	3	18 7/16	1 3/4	.716	8 7/16	.782	4 1/2	4.142
1	7/8"	8	..	..	..	3	18 7/16	2 1/16	.823	8 13/32	..	4 1/2	4.088
1	7/8"	..	14	..	..	3	18 7/16	1 3/4	.823	8 13/32	.907	4 1/2	4.088

* Recommended only for thin nuts.

Tolerances

Element	Range	Direction	Tolerance Cut Thread	Tolerance Ground Thread
Length Overall—A	1/8" and 5/16"	Plus	1/16"	1/16"
	1/4" to 1" incl.	Plus	1/8"	1/8"
Length of Thread—B	1/8" to 1/2" incl.	Plus or Minus	1/16"	1/16"
	9/16" to 1" incl.	Plus or Minus	3/32"	3/32"
Diameter of Shank—D	1/8" to 1/2" incl.	Minus	.005"	.005"
	9/16" to 1" incl.	Minus	.006"	.006"

Formulae

(Approximate)

Diameter of Shank

- National Coarse Series:
  - 5/8" and under = Basic Root Diameter minus .005".
  - 3/4" and over = Basic Root Diameter minus .010" (to nearest .001").
- National Fine Series = For 1/4", and 5/16" sizes only, 95% of Basic Root Diameter. 3/8" and larger, same shank diameter as National Coarse tap of corresponding size.
- National Special Series = Basic Root Diameter.
- Stove Bolt = Basic Root Diameter + .003".

Diameter of Nut Guide

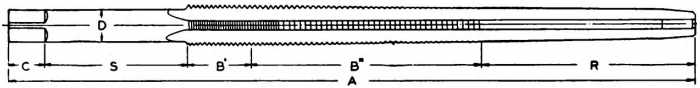
- National Coarse Series = None.
- National Fine Series = None for 1/4" and 5/16" sizes. 3/8" and larger, Basic Root Diameter to nearest .001".

Notes

All taps up to 3/8" inclusive have external center on thread end; sizes 7/16" and larger have internal center in thread end.

For standard thread limits and tolerances see Tables 325, 332, 336 and 337.

TABLE 314
Staybolt Taps



General Dimensions

Diam. of Tap Inches	Dimensions—Inches							
	Length Over-all A	Length of Straight Thread B′	Length of Taper Thread B″	Length of Square C	Diam. of Shank D	Size of Square E	Length of Reamer R	Length of Shank S
7/8	24	2	6	1	.750	5/8	7	8
7/8	27	2	6½	1	.750	5/8	7½	10
15/16	24	2	6	1	.812	5/8	7	8
15/16	27	2	6½	1	.812	5/8	7½	10
1	24	2	6	1	.875	5/8	7	8
1	27	2	6½	1	.875	5/8	7½	10
1 1/16	24	2	6	1	.937	5/8	7	8
1 1/16	27	2	6½	1	.937	5/8	7½	10
1 1/8	24	2	6	1	1.000	3/4	7	8
1 1/8	27	2	6½	1	1.000	3/4	7½	10
1 5/16	24	2	6	1	1.062	3/4	7	8
1 5/16	27	2	6½	1	1.062	3/4	7½	10
1 1/4	24	2	6	1	1.125	3/4	7	8
1 1/4	27	2	6½	1	1.125	3/4	7½	10
1 5/16	24	2	6	1	1.187	3/4	7	8
1 5/16	27	2	6½	1	1.187	3/4	7½	10
1 3/8	24	2	6	1	1.250	1	7	8
1 3/8	27	2	6½	1	1.250	1	7½	10
1 7/16	24	2	6	1	1.312	1	7	8
1 7/16	27	2	6½	1	1.312	1	7½	10
1 1/2	24	2	6	1	1.375	1	7	8
1 1/2	27	2	6½	1	1.375	1	7½	10

Tolerances

Element	Range	Direction	Tolerance
Length Overall—A	7/8″ to 1 1/2″ incl.	Plus or Minus	3/16″
Lengths B′, B″ or R (not accumulative)	7/8″ to 1 1/2″ incl.	Plus or Minus	1/8″
Length of Square—C	7/8″ to 1 1/2″ incl.	Plus or Minus	1/16″
Diameter of Shank—D	7/8″ to 1 1/2″ incl.	Minus	.007″
Size of Square—E	7/8″ to 1 1/2″ incl.	Minus	.008″

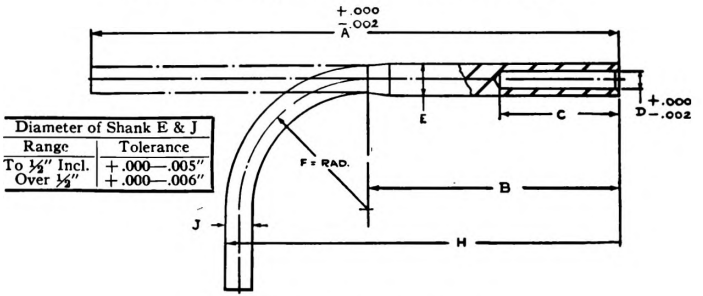
Notes

All taps have internal center in reamer end.
For standard thread limits and tolerances see Table 333.

TABLE 315

Bent Shank Tapper Taps

Sectional Type for Automatic Tapper



Diameter of Shank E & J	
Range	Tolerance
To ½" Incl.	+.000—.005"
Over ½"	+.000—.006"

General Dimensions — Shanks

Diam. of Tap Inches	Size of Mach.	Threads per Inch		Dimensions—Inches							
		N.C.	N.F.	A	B	C	D	E	F	H	J
¼	¼"	20	..	5 9/32	2 9/16	1 1/4	.125	.180	1¼	3 29/32	.180
¼	¼"	..	28	5 ¼	2 17/32	1 ¼	.125	.194	1¼	3 7/8	.194
5/16	¼"	18	..	5 5/16	2 7/16	1 7/16	.1725	.235	1¼	3 13/16	.235
5/16	¼"	..	24	5 3/32	2 11/32	1 7/16	.1725	.245	1¼	3 23/32	.245
¼	5/16"	20	..	7 17/32	3 7/16	1 ¼	.125	.180	1⅞	5 13/32	.180
¼	5/16"	..	28	7 ½	3 13/32	1 ¼	.125	.194	1⅞	5 5/8	.194
5/16	5/16"	18	..	7 5/16	3 11/32	1 7/16	.1725	.235	1⅞	5 21/64	.235
5/16	5/16"	..	24	7 11/32	3 7/32	1 7/16	.1725	.245	1⅞	5 7/32	.245
5/16	5/16"	16	..	7 5/16	3 1/16	1 ¾	.2145	.289	1⅞	5 5/64	.289
3/8	5/16"	..	24	7 5/32	3	1 ¾	.2145	.316	1⅞	5 1/64	.289
7/16	5/16"	14	..	6 15/16	2 25/32	1 ¾	.2625	.340	1⅞	4 53/64	.340
7/16	⅜"	..	20	7 7/16	2 29/32	1 ¾	.2625	.368	1⅞	4 61/64	.340
⅜	7/16"	16	..	10 7/16	4 9/16	1 ¾	.2145	.289	2½	7 13/64	.289
⅜	7/16"	..	24	10 15/32	4 ½	1 ¾	.2145	.316	2½	7 9/64	.289
7/16	7/16"	14	..	10 5/16	4 9/32	1 ¾	.2625	.340	2½	6 61/64	.340
7/16	7/16"	..	20	10 5/16	4 13/32	1 ¾	.2625	.368	2½	7 5/64	.340
½	7/16"	13	..	9 15/16	4	1 25/32	.309	.395	2½	6 45/64	.395
½	7/16"	..	20	10 5/16	4 ¼	1 25/32	.309	.430	2½	6 61/64	.395
9/16	7/16"	12	..	9 15/16	3 27/32	1 25/32	.344	.449	2½	6 9/16	.449
9/16	½"	..	18	9 15/16	3 31/32	1 25/32	.344	.485	2½	6 11/16	.449
9/16	5/8"	12	..	12 13/16	5 3/32	1 25/32	.344	.449	3¾	9 1/16	.449
9/16	5/8"	..	18	12 13/16	5 7/32	1 25/32	.344	.485	3¾	9 3/16	.449
5/8	5/8"	11	..	12 1/2	4 3/4	1 7/8	.405	.502	3¾	8 3/4	.502
5/8	5/8"	..	18	12 13/16	5 1/16	1 7/8	.405	.548	3¾	9 1/16	.502
¾	5/8"	10	..	12 7/16	4 3/8	1 7/8	.467	.605	3¾	8 27/64	.605
¾	5/8"	..	16	12 3/8	4 5/16	1 7/8	.467	.654	3¾	8 39/64	.605
¾	7/8"	10	..	15 5/8	5 11/16	1 7/8	.467	.605	4½	10 31/64	.605
¾	7/8"	..	16	15 13/16	5 7/8	1 7/8	.467	.654	4½	10 43/64	.605

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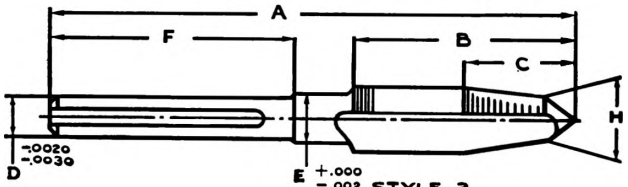
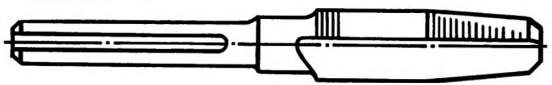
TABLE 315 • Bent Shank Tapper Taps — (Concluded)

Sectional Type for Automatic Tapper





STYLE 1

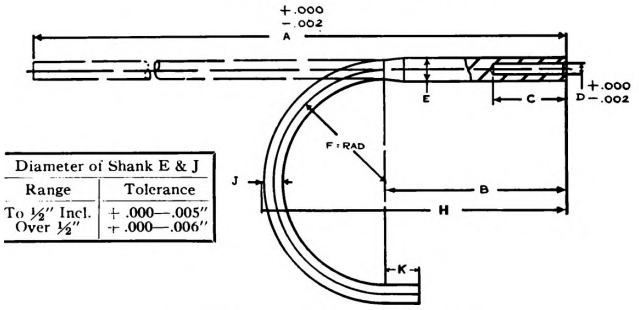
General Dimensions — Nibs

Diam. of Tap Inches	Size of Mach.	Style of Nib	Threads per Inch		Dimensions—Inches						
			N.C.	N.F.	A	B	C	D	E	F	H
1/4	1/4"	2	20	..	2 7/32	23/32	17/32	.125	.185	1	.185
1/4	1/4"	2	..	28	2 1/4	3/4	9/16	.125	.204	1	.192
5/16	1/4"	2	18	..	2 1/2	13/16	19/32	.1725	.240	1 3/16	.232
5/16	1/4"	2	..	24	2 19/32	29/32	21/32	.1725	.258	1 3/16	.246
1/4	5/16"	2	20	..	2 7/32	23/32	17/32	.125	.185	1	.185
1/4	5/16"	2	..	28	2 1/4	3/4	9/16	.125	.204	1	.192
5/16	5/16"	2	18	..	2 1/2	13/16	19/32	.1725	.240	1 3/16	.232
5/16	5/16"	2	..	24	2 19/32	29/32	21/32	.1725	.258	1 3/16	.246
3/8	5/16"	2	16	..	3 1/16	15/16	11/16	.2145	.294	1 1/16	.286
3/8	5/16"	2	..	24	3 3/32	31/32	23/32	.2145	.321	1 1/16	.309
7/16	5/16"	1	14	..	3 5/16	1 3/16	25/32	.2625	.345	1 1/16	.337
7/16	5/16"	1	..	20	3 3/16	1 1/16	13/32	.2625	.373	1 1/2	.361
3/8	1/2"	2	16	..	3 1/16	15/16	11/16	.2145	.294	1 1/16	.286
3/8	1/2"	2	..	24	3 3/32	31/32	23/32	.2145	.321	1 1/16	.309
7/16	1/2"	1	14	..	3 5/16	1 3/16	25/32	.2625	.345	1 1/16	.337
7/16	1/2"	1	..	20	3 3/16	1 1/16	13/32	.2625	.373	1 1/2	.361
1/2	1/2"	1	13	..	3 19/32	1 5/16	29/32	.309	.400	1 17/32	.392
1/2	1/2"	1	..	20	3 11/32	1 1/16	13/32	.309	.435	1 17/32	.423
9/16	1/2"	1	12	..	3 23/32	1 7/16	27/32	.344	.454	1 17/32	.446
9/16	1/2"	1	..	18	3 19/32	1 5/16	21/32	.344	.490	1 17/32	.478
9/16	5/8"	1	12	..	3 23/32	1 7/16	27/32	.344	.454	1 17/32	.446
9/16	5/8"	1	..	18	3 19/32	1 5/16	21/32	.344	.490	1 17/32	.478
5/8	5/8"	1	11	..	4 1/8	1 5/8	29/32	.405	.507	1 5/8	.499
5/8	5/8"	1	..	18	3 13/16	1 5/16	21/32	.405	.553	1 5/8	.541
3/4	5/8"	1	10	..	4 7/16	1 11/16	1	.467	.620	1 5/8	.612
3/4	5/8"	1	..	16	4 1/4	1 5/8	3/4	.467	.669	1 5/8	.657
3/4	7/8"	1	10	..	4 7/16	1 13/16	1	.467	.620	1 5/8	.612
3/4	7/8"	1	..	16	4 1/4	1 5/8	3/4	.467	.669	1 5/8	.657

TABLE 316

National Hook Taps

Sectional Type for Precision Tapper



Diameter of Shank E & J	
Range	Tolerance
To ½" Incl.	+ .000—.005"
Over ½"	+ .000—.006"

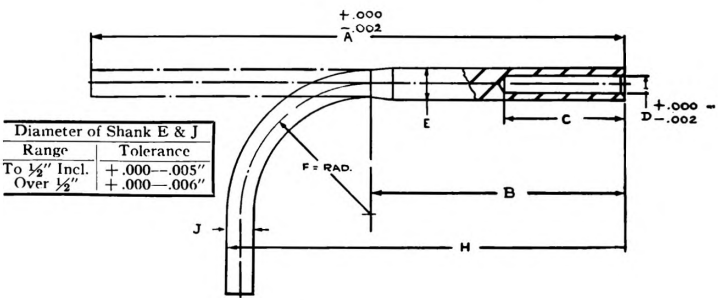
General Dimensions — Shanks

Diam. of Tap Inches	Size of Mach.	Threads per Inch		Dimensions—Inches								
		N.C.	N.F.	A	B	C	D	E	F	H	J	K
1/4	1/4"	20	..	$7^{15}/_{32}$	$2^{29}/_{32}$	1 1/4	.125	.180	1 1/4	$4^{15}/_{64}$	.148	1/2
1/4	1/4"	..	28	$7^{17}/_{32}$	$2^{31}/_{32}$	1 1/4	.125	.194	1 1/4	$4^{19}/_{64}$	.163	1/2
5/16	1/4"	18	..	7 5/16	$2^{23}/_{32}$	1 7/16	.1725	.235	1 1/4	4 1/16	.192	1/2
5/16	1/4"	..	24	7 5/16	$2^{23}/_{32}$	1 7/16	.1725	.245	1 1/4	4 5/64	.206	1/2
5/16	3/8"	18	..	10 7/8	4 5/32	1 7/16	.1725	.235	1 7/8	6 1/8	.192	5/8
5/16	3/8"	..	24	10 7/8	4 5/32	1 7/16	.1725	.245	1 7/8	$6^{9}/_{64}$	.206	5/8
3/8	3/8"	16	..	10 7/8	3 7/8	1 3/4	.2145	.289	1 7/8	5 7/8	.235	5/8
3/8	3/8"	..	24	10 3/4	$3^{31}/_{32}$	1 3/4	.2145	.316	1 7/8	$5^{31}/_{32}$	.257	5/8
7/16	3/8"	14	..	10 7/16	3 7/8	1 3/4	.2625	.340	1 7/8	$5^{57}/_{64}$	.276	5/8
7/16	3/8"	..	20	10 5/8	4 1/16	1 3/4	.2625	.368	1 7/8	6 3/32	.298	5/8
3/8	1/2"	16	..	13 1/8	4 5/16	1 3/4	.2145	.289	2 1/2	$6^{59}/_{64}$	.235	3/4
3/8	1/2"	..	24	13 1/4	$4^{13}/_{32}$	1 3/4	.2145	.316	2 1/2	7 1/32	.257	3/4
7/16	1/2"	14	..	$12^{15}/_{16}$	4 5/16	1 3/4	.2625	.340	2 1/2	$6^{61}/_{64}$	.276	3/4
7/16	1/2"	..	20	13 1/8	4 1/2	1 3/4	.2625	.368	2 1/2	7 9/64	.298	3/4
1/2	1/2"	13	..	12 3/4	4 1/8	$1^{25}/_{32}$	.309	.395	2 1/2	$6^{25}/_{32}$	.320	3/4
1/2	1/2"	..	20	13	4 3/8	$1^{25}/_{32}$	.309	.430	2 1/2	7 3/64	.348	3/4
9/16	1/2"	12	..	12 5/8	4	$1^{25}/_{32}$	.344	.449	2 1/2	$6^{11}/_{16}$	.363	3/4
9/16	1/2"	..	18	$12^{13}/_{16}$	4 5/16	$1^{25}/_{32}$	.344	.485	2 1/2	$6^{57}/_{64}$	.392	3/4
9/16	3/4"	12	..	20	$6^{59}/_{64}$	$1^{25}/_{32}$	.344	449	3 3/4	$10^{55}/_{64}$	.363	1 1/4
9/16	3/4"	..	18	20 3/16	7 7/64	$1^{25}/_{32}$	.344	.485	3 3/4	11 1/16	.392	1 1/4
5/8	3/4"	11	..	19 3/4	$6^{43}/_{64}$	1 7/8	.405	.502	3 3/4	10 5/8	.406	1 1/4
5/8	3/4"	..	18	20 1/16	$6^{63}/_{64}$	1 7/8	.405	.548	3 3/4	$10^{61}/_{64}$	.442	1 1/4
3/4	3/4"	10	..	19 1/2	$6^{27}/_{64}$	1 7/8	.467	.605	3 3/4	$10^{27}/_{64}$	.496	1 1/4
3/4	3/4"	..	16	19 3/4	$6^{43}/_{64}$	1 7/8	.467	.654	3 3/4	$10^{11}/_{16}$	.535	1 1/4
7/8	3/4"	9	..	19 1/4	$6^{11}/_{64}$	2 1/8	.528	.716	3 3/4	10 7/32	.585	1 1/4
7/8	3/4"	..	14	19 5/8	$6^{35}/_{64}$	2 1/8	.528	.767	3 3/4	$10^{39}/_{64}$	.626	1 1/4

(Concluded on following page)

TABLE 316 • National Hook Taps — (Concluded)

Sectional Type for Precision Tapper



Diameter of Shank E & J	
Range	Tolerance
To ½" Incl.	+.000—.005"
Over ½"	+.000—.006"

General Dimensions — Nibs

Diam. of Tap Inches	Size of Mach.	Style of Nib	Threads per Inch		Dimensions—Inches						
			N.C.	N.F.	A	B	C	D	E	F	H
1/4	1/4"	2	20	..	2 11/16	1 7/32	5/8	.125	.185	1	.185
1/4	1/4"	2	..	28	2 21/32	1 5/32	9/16	.125	.204	1	.204
5/16	1/4"	2	18	..	3 3/32	1 13/32	23/32	.1725	.240	1 3/16	.240
5/16	1/4"	2	..	24	3 3/32	1 13/32	21/32	.1725	.258	1 3/16	.258
5/16	3/8"	2	18	..	3 3/32	1 13/32	23/32	.1725	.240	1 3/16	.240
5/16	3/8"	2	..	24	3 3/32	1 13/32	21/32	.1725	.258	1 3/16	.258
3/8	3/8"	2	16	..	3 11/16	1 9/16	13/16	.2145	.294	1 1/2	.294
3/8	3/8"	2	..	24	3 19/32	1 13/32	23/32	.2145	.321	1 1/2	.321
7/16	3/8"	1	14	..	3 11/16	1 9/16	23/32	.2625	.345	1 1/2	.345
7/16	3/8"	1	..	20	3 1/2	1 3/8	19/32	.2625	.373	1 1/2	.373
3/8	1/2"	2	16	..	3 11/16	1 9/16	13/16	.2145	.294	1 1/2	.294
3/8	1/2"	2	..	24	3 19/32	1 13/32	23/32	.2145	.321	1 1/2	.321
7/16	1/2"	1	14	..	3 11/16	1 9/16	23/32	.2625	.345	1 1/2	.345
7/16	1/2"	1	..	20	3 1/2	1 3/8	19/32	.2625	.373	1 1/2	.373
1/2	1/2"	1	13	..	3 21/32	1 5/8	25/32	.309	.400	1 17/32	.400
1/2	1/2"	1	..	20	3 21/32	1 3/8	19/32	.309	.435	1 17/32	.435
9/16	1/2"	1	12	..	4 1/32	1 1/4	27/32	.344	.454	1 17/32	.454
9/16	1/2"	1	..	18	3 27/32	1 9/16	21/32	.344	.490	1 17/32	.490
9/16	3/4"	1	12	..	4 1/32	1 3/4	27/32	.344	.454	1 17/32	.454
9/16	3/4"	1	..	18	3 27/32	1 9/16	21/32	.344	.490	1 17/32	.490
5/8	3/4"	1	11	..	4 3/8	1 7/8	29/32	.405	.507	1 5/8	.507
5/8	3/4"	1	..	18	4 1/16	1 9/16	21/32	.405	.553	1 5/8	.553
3/4	3/4"	1	10	..	4 5/8	2	1	.467	.620	1 5/8	.620
3/4	3/4"	1	..	16	4 3/8	1 3/4	3/4	.467	.669	1 5/8	.669
7/8	3/4"	1	9	..	5 1/8	2 1/4	1 1/8	.528	.731	1 7/8	.731
7/8	3/4"	1	..	14	4 3/4	1 7/8	1	.528	.782	1 7/8	.782

TABLE 325

Fractional Size Taps

Cut Thread—American National Form

Thread Limits

Size	Threads per Inch			Major Diameter			Pitch Diameter		
	N.C.	N.F.	N.S.	Basic	Minimum	Maximum	Basic	Minimum	Maximum
1/16	..	..	64	.0625	.0635	.0650	.0524	.0526	.0536
5/64	..	..	60	.0781	.0792	.0807	.0673	.0675	.0685
3/32	..	..	48	.0938	.0951	.0966	.0803	.0805	.0815
3/32	..	..	50	.0938	.0951	.0966	.0808	.0810	.0820
7/64	..	..	48	.1094	.1107	.1127	.0959	.0961	.0976
1/8	..	..	40	.1250	.1266	.1286	.1088	.1090	.1105
9/64	..	..	40	.1406	.1422	.1442	.1244	.1246	.1261
5/32	..	..	32	.1563	.1585	.1605	.1360	.1365	.1380
5/32	..	..	36	.1563	.1580	.1600	.1382	.1384	.1399
3/16	..	..	24	.1875	.1903	.1923	.1604	.1609	.1624
3/16	..	..	32	.1875	.1897	.1917	.1672	.1677	.1692
7/32	..	..	24	.2188	.2216	.2236	.1917	.1922	.1937
7/32	..	..	32	.2188	.2210	.2230	.1985	.1990	.2005
1/4	20	..	..	.2500	.2532	.2557	.2175	.2180	.2200
1/4	..	..	24	.2500	.2528	.2553	.2229	.2234	.2254
1/4	..	..	27	.2500	.2525	.2550	.2259	.2264	.2284
1/4	..	28	..	.2500	.2524	.2549	.2268	.2273	.2288
1/4	..	..	32	.2500	.2522	.2547	.2297	.2302	.2317
5/16	18	..	..	.3125	.3160	.3185	.2764	.2769	.2789
5/16	..	..	20	.3125	.3157	.3182	.2800	.2805	.2825
5/16	..	24	..	.3125	.3153	.3178	.2854	.2859	.2874
5/16	..	..	27	.3125	.3150	.3175	.2884	.2889	.2904
5/16	..	..	32	.3125	.3147	.3172	.2922	.2927	.2942
3/8	16	..	..	.3750	.3789	.3814	.3344	.3349	.3369
3/8	..	..	20	.3750	.3782	.3807	.3425	.3430	.3450
3/8	..	24	..	.3750	.3778	.3803	.3479	.3484	.3499
3/8	..	..	27	.3750	.3775	.3800	.3509	.3514	.3529
7/16	14	..	..	.4375	.4419	.4449	.3911	.3916	.3941
7/16	..	20	..	.4275	.4407	.4437	.4050	.4055	.4075
7/16	..	..	24	.4375	.4403	.4433	.4104	.4109	.4129
7/16	..	..	27	.4375	.4400	.4430	.4134	.4139	.4159
1/2	..	..	12	.5000	.5050	.5080	.4459	.4464	.4489
1/2	13	..	..	.5000	.5047	.5077	.4500	.4505	.4530
1/2	..	20	..	.5000	.5032	.5062	.4675	.4680	.4700
1/2	..	..	24	.5000	.5028	.5058	.4729	.4734	.4754
1/2	..	..	27	.5000	.5025	.5055	.4759	.4764	.4784
9/16	12	..	..	.5625	.5675	.5705	.5084	.5089	.5114
9/16	..	18	..	.5625	.5660	.5690	.5264	.5269	.5289
9/16	..	..	27	.5625	.5650	.5680	.5384	.5389	.5409
5/8	11	..	..	.6250	.6304	.6334	.5660	.5665	.5690
5/8	..	..	12	.6250	.6300	.6330	.5709	.5714	.5739
5/8	..	18	..	.6250	.6285	.6315	.5889	.5894	.5914

(Continued on following page)

TABLE 325

Fractional Size Taps

Cut Thread—American National Form

(Continued)

Thread Limits

Size	Threads per Inch			Major Diameter			Pitch Diameter		
	N.C.	N.F.	N.S.	Basic	Minimum	Maximum	Basic	Minimum	Maximum
5/8	..	..	27	.6250	.6275	.6305	.6009	.6014	.6034
11/16	..	..	11	.6875	.6929	.6969	.6285	.6290	.6320
11/16	..	..	16	.6875	.6914	.6954	.6469	.6474	.6499
3/4	10	..	..	.7500	.7559	.7599	.6850	.6855	.6885
3/4	..	..	12	.7500	.7550	.7590	.6959	.6964	.6994
3/4	..	16	..	.7500	.7539	.7579	.7094	.7099	.7124
3/4	..	..	27	.7500	.7525	.7565	.7259	.7264	.7289
7/8	9	..	..	.8750	.8820	.8860	.8028	.8038	.8068
7/8	..	..	12	.8750	.8805	.8845	.8209	.8219	.8249
7/8	..	14	..	.8750	.8799	.8839	.8286	.8296	.8321
7/8	..	..	18	.8750	.8790	.8830	.8389	.8399	.8424
7/8	..	..	27	.8750	.8780	.8820	.8509	.8519	.8544
1	8	..	..	1.0000	1.0078	1.0118	.9188	.9198	.9228
1	..	..	12	1.0000	1.0055	1.0095	.9459	.9469	.9499
1	..	14	..	1.0000	1.0049	1.0089	.9536	.9546	.9571
1	..	..	27	1.0000	1.0030	1.0070	.9759	.9769	.9794
1 1/8	7	..	..	1.1250	1.1337	1.1382	1.0322	1.0332	1.0367
1 1/8	..	12	..	1.1250	1.1305	1.1350	1.0709	1.0719	1.0749
1 1/4	7	..	..	1.2500	1.2587	1.2632	1.1572	1.1582	1.1617
1 1/4	..	12	..	1.2500	1.2555	1.2600	1.1959	1.1969	1.1999
1 3/8	6	..	..	1.3750	1.3850	1.3895	1.2667	1.2677	1.2712
1 3/8	..	12	..	1.3750	1.3805	1.3850	1.3209	1.3219	1.3249
1 1/2	6	..	..	1.5000	1.5100	1.5145	1.3917	1.3927	1.3962
1 1/2	..	12	..	1.5000	1.5055	1.5100	1.4459	1.4469	1.4499
1 5/8	..	..	5 1/2	1.6250	1.6344	1.6399	1.5069	1.5084	1.5124
1 3/4	5	..	..	1.7500	1.7602	1.7657	1.6201	1.6216	1.6256
1 7/8	..	..	5	1.8750	1.8852	1.8907	1.7451	1.7466	1.7506
2	4 1/2	..	..	2.0000	2.0111	2.0166	1.8557	1.8572	1.8612
2 1/8	..	..	4 1/2	2.1250	2.1361	2.1421	1.9807	1.9822	1.9867
2 1/4	4 1/2	..	..	2.2500	2.2611	2.2671	2.1057	2.1072	2.1117
2 3/8	..	..	4	2.3750	2.3878	2.3938	2.2126	2.2146	2.2191
2 1/2	4	..	..	2.5000	2.5128	2.5188	2.3376	2.3396	2.3441
2 5/8	..	..	4	2.6250	2.6378	2.6448	2.4626	2.4646	2.4696
2 3/4	4	..	..	2.7500	2.7628	2.7698	2.5876	2.5896	2.5946
2 7/8	..	..	3 1/2	2.8750	2.8894	2.8964	2.6894	2.6914	2.6964
3	4	..	..	3.0000	3.0133	3.0203	2.8376	2.8401	2.8456
3 1/4	4	..	..	3.2500	3.2633	3.2703	3.0876	3.0901	3.0956
3 1/2	4	..	..	3.5000	3.5133	3.5203	3.3376	3.3401	3.3456
3 3/4	4	..	..	3.7500	3.7633	3.7703	3.5876	3.5901	3.5956
4	4	..	..	4.0000	4.0133	4.0203	3.8376	3.8401	3.8456

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TABLE 325

Fractional Size Taps

Cut Thread—American National Form
(Concluded)

Lead Tolerance

A maximum lead error of plus or minus .003″ in one inch of thread is permitted.

Angle Tolerance

Threads per Inch	Error in Half Angle	Error in Full Angle
4 and coarser.	30′ Plus or Minus	45′
4½ to 5½ incl.	35′ Plus or Minus	53′
6 to 9 incl.	40′ Plus or Minus	60′
10 to 28 incl.	45′ Plus or Minus	68′
30 to 64 incl.	60′ Plus or Minus	90′

Formulae

Minimum Major Diameter = Basic plus (B+C)

Maximum Major Diameter = Minimum plus A

Minimum Pitch Diameter = Basic plus B

Maximum Pitch Diameter = Minimum plus D

In the above formulae:—

A = Major diameter tolerance

B = Amount minimum pitch diameter is over basic

C = A constant to add:

20% of the theoretical truncation for 2 to 5½ threads per inch

25% for 6 to 64 threads per inch

D = Pitch diameter tolerance

For values of A, B, C and D see Table 330.

Notes

Pitches coarser than N. F. take N. C. tolerances. Pitches finer than N. F. take tolerances as shown in Table 330.

For Staybolt Taps see Table 333.

TABLE 326

Fractional Size Taps

Commercial Ground Thread—American National Form

Thread Limits

Size	Threads per Inch			Major Diameter			Pitch Diameter		
	N.C.	N.F.	N.S.	Basic	Minimum	Maximum	Basic	Minimum	Maximum
1/4	20	..	..	.2500	.2540	.2550	.2175	.2180	.2190
1/4	..	28	..	.2500	.2525	.2535	.2268	.2273	.2283
5/16	18	..	..	.3125	.3170	.3180	.2764	.2769	.2779
5/16	..	24	..	.3125	.3155	.3165	.2854	.2859	.2869
3/8	16	..	..	.3750	.3800	.3810	.3344	.3349	.3359
3/8	..	24	..	.3750	.3780	.3790	.3479	.3484	.3494
7/16	14	..	..	.4375	.4435	.4445	.3911	.3916	.3926
7/16	..	20	..	.4375	.4415	.4425	.4050	.4055	.4065
1/2	13	..	..	.5000	.5065	.5075	.4500	.4505	.4515
1/2	..	20	..	.5000	.5040	.5050	.4675	.4680	.4690
9/16	12	..	..	.5625	.5690	.5700	.5084	.5089	.5099
9/16	..	18	..	.5625	.5670	.5680	.5264	.5269	.5279
5/8	11	..	..	.6250	.6320	.6330	.5660	.5665	.5676
5/8	..	18	..	.6250	.6295	.6305	.5889	.5894	.5904
11/16	..	..	11	.6875	.6945	.6955	.6285	.6290	.6301
11/16	..	..	16	.6875	.6925	.6935	.6469	.6474	.6484
3/4	10	..	..	.7500	.7575	.7590	.6850	.6855	.6866
3/4	..	16	..	.7500	.7550	.7560	.7094	.7099	.7109
7/8	9	..	..	.8750	.8835	.8850	.8028	.8038	.8050
7/8	..	14	..	.8750	.8810	.8820	.8286	.8296	.8306
7/8	..	..	18	.8750	.8795	.8805	.8389	.8399	.8409
1	8	..	..	1.0000	1.0095	1.0110	.9188	.9198	.9212
1	..	14	..	1.0000	1.0060	1.0070	.9536	.9546	.9556
1 1/8	7	..	..	1.1250	1.1350	1.1370	1.0322	1.0332	1.0347
1 1/8	..	12	..	1.1250	1.1315	1.1325	1.0709	1.0719	1.0729
1 1/4	7	..	..	1.2500	1.2600	1.2620	1.1572	1.1582	1.1597
1 1/4	..	12	..	1.2500	1.2565	1.2575	1.1959	1.1969	1.1979
1 3/8	6	..	..	1.3750	1.3870	1.3890	1.2667	1.2677	1.2695
1 3/8	..	12	..	1.3750	1.3815	1.3825	1.3209	1.3219	1.3229
1 1/2	6	..	..	1.5000	1.5120	1.5140	1.3917	1.3927	1.3945
1 1/2	..	12	..	1.5000	1.5065	1.5075	1.4459	1.4469	1.4479
1 5/8	..	..	5 1/2	1.6250	1.6385	1.6410	1.5069	1.5084	1.5104
1 3/4	5	..	..	1.7500	1.7635	1.7660	1.6201	1.6216	1.6236
1 7/8	..	..	5	1.8750	1.8885	1.8910	1.7451	1.7466	1.7486
2	4 1/2	..	..	2.0000	2.0145	2.0170	1.8557	1.8572	1.8592
2 1/4	4 1/2	..	..	2.2500	2.2645	2.2670	2.1057	2.1072	2.1092
2 1/2	4	..	..	2.5000	2.5165	2.5190	2.3376	2.3396	2.3416
2 3/4	4	..	..	2.7500	2.7665	2.7690	2.5876	2.5896	2.5916

(Concluded on following page)

TABLE 326

Fractional Size Taps

Commercial Ground Thread—American National Form

(Concluded)

Thread Limits

Size	Threads per Inch			Major Diameter			Pitch Diameter		
	N.C.	N.F.	N.S.	Basic	Minimum	Maximum	Basic	Minimum	Maximum
3	4	..	..	3.0000	3.0165	3.0190	2.8376	2.8396	2.8416
3¼	4	..	..	3.2500	3.2665	3.2690	3.0876	3.0896	3.0916
3½	4	..	..	3.5000	3.5165	3.5190	3.3376	3.3396	3.3416
3¾	4	..	..	3.7500	3.7665	3.7690	3.5876	3.5896	3.5916
4	4	..	..	4.0000	4.0165	4.0190	3.8376	3.8396	3.8416

Lead Tolerance

A maximum lead error of plus or minus .0005″ in one inch of thread is permitted.

Angle Tolerance

Threads per Inch	Error in Half Angle
4 to 5½ incl.	20′ Plus or Minus
6 to 9 incl.	25′ Plus or Minus
10 to 28 incl.	30′ Plus or Minus

Formulae

Maximum Major Diameter = Basic plus C
Minimum Major Diameter = Maximum minus A
Maximum Pitch Diameter = Minimum plus D
Minimum Pitch Diameter = Basic plus B

In the above formulae:—

A = Major diameter tolerance
B = Amount over basic for minimum pitch diameter
C = A constant to add:
35% of the theoretical truncation for 4 to 5 threads per inch
40% for 5½ to 12 threads per inch
45% for 13 to 48 threads per inch
To nearest .0005″ for 8 or more threads per inch and to nearest .001″ for less than 8 threads per inch
D = Pitch diameter tolerance
For values of A, B, C and D see Table 331.

Notes

All fractional size ground thread taps are regularly made to the above limits and tolerances unless otherwise specified.

For Precision ground thread pitch diameter limits for hand taps see Table 327.

TABLE 327

Fractional Size Taps

Precision Ground Thread—American National Form

Thread Limits

Size	Threads per Inch		Major Diameter		Basic Pitch Diam.	Pitch Diameter Limits					
						01 Limit		1 Limit		2 Limit	
	N.C.	N.F.	Minimum	Maximum		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
1/4	20	..	.2540	.2550	.2175	.2170	.2175	.2175	.2180	.2180	.2185
1/4	..	28	.2525	.2535	.2268	....	....	.2268	.2273	.2273	.2278
5/16	18	..	.3170	.3180	.2764	.2759	.2764	.2764	.2769	.2769	.2774
5/16	..	24	.3155	.3165	.2854	....	....	.2854	.2859	.2859	.2864
3/8	16	..	.3800	.3810	.3344	.3339	.3344	.3344	.3349	.3349	.3354
3/8	..	24	.3780	.3790	.3479	....	....	.3479	.3484	.3484	.3489
7/16	14	..	.4435	.4445	.3911	.3906	.3911	.3911	.3916	.3916	.3921
7/16	..	20	.4415	.4425	.4050	....	....	.4050	.4055	.4055	.4060
1/2	13	..	.5065	.5075	.4500	.4495	.4500	.4500	.4505	.4505	.4510
1/2	..	20	.5040	.5050	.4675	....	....	.4675	.4680	.4680	.4685
9/16	12	..	.5690	.5700	.5084	....	....	.5084	.5089	.5089	.5094
9/16	..	18	.5670	.5680	.5264	....	....	.5264	.5269	.5269	.5274
5/8	11	..	.6320	.6330	.5660	....	....	.5660	.5665	.5665	.5670
5/8	..	18	.6295	.6305	.5889	....	....	.5889	.5894	.5894	.5899
3/4	10	..	.7575	.7590	.6850	....	....	.6850	.6855	.6855	.6860
3/4	..	16	.7550	.7560	.7094	....	....	.7094	.7099	.7099	.7104
7/8	9	..	.8835	.8850	.8028	....	....	.8028	.8033	.8033	.8038
7/8	..	14	.8810	.8820	.8286	....	....	.8286	.8291	.8291	.8296
1	8	..	1.0095	1.0110	.9188	....	....	.9188	.9193	.9193	.9198
1	..	14	1.0060	1.0070	.9536	....	....	.9536	.9541	.9541	.9546

Lead Tolerance

A maximum lead error of plus or minus .0005″ in one inch of thread is permitted.

Angle Tolerance

Threads per Inch	Error in Half Angle
8 to 9 Incl.	25′ plus or minus
10 to 28 Incl.	30′ plus or minus

Formulae

Major Diameter is the same as for commercial ground taps.
Pitch Diameter 01 Limit = Basic to basic minus .0005″
Pitch Diameter 1 Limit = Basic to basic plus .0005″
Pitch Diameter 2 Limit = Basic plus .0005″ to basic plus .0010″

Notes

Precision ground thread hand taps not listed in table above are special.

For commercial ground thread limits see Table 326.

TABLE 328

Machine Screw Taps

Cut Thread—American National Form

Thread Limits

Screw Gage No.	Threads per Inch			Major Diameter			Pitch Diameter		
	N.C.	N.F.	N.S.	Basic	Minimum	Maximum	Basic	Minimum	Maximum
0	..	80	..	.0600	.0609	.0624	.0519	.0521	.0531
1	..	..	56	.0730	.0742	.0757	.0614	.0616	.0626
1	64	..	..	.0730	.0740	.0755	.0629	.0631	.0641
1	..	72	..	.0730	.0740	.0755	.0640	.0642	.0652
2	56	..	..	.0860	.0872	.0887	.0744	.0746	.0756
2	..	64	..	.0860	.0870	.0885	.0759	.0761	.0771
3	48	..	..	.0990	.1003	.1018	.0855	.0857	.0867
3	..	56	..	.0990	.1002	.1017	.0874	.0876	.0886
4	..	..	32	.1120	.1142	.1162	.0917	.0922	.0937
4	..	..	36	.1120	.1137	.1157	.0940	.0942	.0957
4	40	..	..	.1120	.1136	.1156	.0958	.0960	.0975
4	..	48	..	.1120	.1133	.1153	.0985	.0987	.1002
5	..	..	36	.1250	.1267	.1287	.1070	.1072	.1087
5	40	..	..	.1250	.1266	.1286	.1088	.1090	.1105
5	..	44	..	.1250	.1264	.1284	.1102	.1104	.1119
6	32	..	..	.1380	.1402	.1422	.1177	.1182	.1197
6	..	..	36	.1380	.1397	.1417	.1200	.1202	.1217
6	..	40	..	.1380	.1396	.1416	.1218	.1220	.1235
7	..	..	30	.1510	.1533	.1553	.1294	.1299	.1314
7	..	..	32	.1510	.1532	.1552	.1307	.1312	.1327
7	..	..	36	.1510	.1527	.1547	.1330	.1332	.1347
8	..	..	30	.1640	.1663	.1683	.1423	.1428	.1443
8	32	..	..	.1640	.1662	.1682	.1437	.1442	.1457
8	..	36	..	.1640	.1657	.1677	.1460	.1462	.1477
8	..	..	40	.1640	.1656	.1676	.1478	.1480	.1495
9	..	..	24	.1770	.1798	.1818	.1499	.1504	.1519
9	..	..	30	.1770	.1793	.1813	.1553	.1558	.1573
9	..	..	32	.1770	.1792	.1812	.1567	.1572	.1587
10	24	..	..	.1900	.1928	.1948	.1629	.1634	.1649
10	..	..	28	.1900	.1924	.1944	.1668	.1673	.1688
10	..	..	30	.1900	.1923	.1943	.1684	.1689	.1704
10	..	32	..	.1900	.1922	.1942	.1697	.1702	.1717
12	24	..	..	.2160	.2188	.2208	.1889	.1894	.1909
12	..	28	..	.2160	.2184	.2204	.1928	.1933	.1948
12	..	..	32	.2160	.2182	.2202	.1957	.1962	.1977
14	..	..	20	.2420	.2452	.2477	.2095	.2100	.2120

(Concluded on following page)

TABLE 328

Machine Screw Taps

Cut Thread—American National Form
(Concluded)

Thread Limits

Screw Gage No.	Threads per Inch			Major Diameter			Pitch Diameter		
	N.C.	N.F.	N.S.	Basic	Minimum	Maximum	Basic	Minimum	Maximum
14	..	..	24	.2420	.2448	.2473	.2149	.2154	.2174
16	..	..	18	.2680	.2715	.2740	.2319	.2324	.2344
16	..	..	20	.2680	.2712	.2737	.2355	.2360	.2380
16	..	..	22	.2680	.2710	.2735	.2385	.2390	.2410
18	..	..	18	.2940	.2975	.3000	.2579	.2584	.2604
18	..	..	20	.2940	.2972	.2997	.2615	.2620	.2640
20	..	..	16	.3200	.3239	.3264	.2794	.2799	.2819
20	..	..	18	.3200	.3235	.3260	.2839	.2844	.2864
20	..	..	20	.3200	.3232	.3257	.2875	.2880	.2900

Lead Tolerance

A maximum lead error of plus or minus .003″ in one inch of thread is permitted.

Angle Tolerance

Threads per Inch	Error in Half Angle	Error in Full Angle
16 to 28 inclusive	45′ Plus or Minus	68′
30 and finer	60′ Plus or Minus	90′

Formulae

Minimum Major Diameter = Basic plus (B+C)
Maximum Major Diameter = Minimum plus A

Minimum Pitch Diameter = Basic plus B
Maximum Pitch Diameter = Minimum plus D

In the above formulae:—

A = Major diameter tolerance
B = Amount minimum pitch diameter is over basic
C = A constant to add:
25% of the theoretical truncation for 16 to 80 threads per inch
D = Pitch diameter tolerance

For values of A, B, C and D see Table 330.

TABLE 329
Machine Screw Taps
Commercial Ground Thread—American National Form
Thread Limits

Screw Gage No.	Threads per Inch			Major Diameter			Pitch Diameter		
	N.C.	N.F.	N.S.	Basic	Minimum	Maximum	Basic	Minimum	Maximum
3	48	..	..	.0990	.1000	.1010	.0855	.0857	.0867
3	..	56	..	.0990	.0995	.1005	.0874	.0876	.0886
4	..	..	36	.1120	.1135	.1145	.0940	.0942	.0952
4	40	..	..	.1120	.1135	.1145	.0958	.0960	.0970
4	..	48	..	.1120	.1130	.1140	.0985	.0987	.0997
5	40	..	..	.1250	.1265	.1275	.1088	.1090	.1100
5	..	44	..	.1250	.1260	.1270	.1102	.1104	.1114
6	32	..	..	.1380	.1400	.1410	.1177	.1182	.1192
6	..	40	..	.1380	.1395	.1405	.1218	.1220	.1230
8	32	..	..	.1640	.1660	.1670	.1437	.1442	.1452
8	..	36	..	.1640	.1655	.1665	.1460	.1462	.1472
10	24	..	..	.1900	.1930	.1940	.1629	.1634	.1644
10	..	32	..	.1900	.1920	.1930	.1697	.1702	.1712
12	24	..	..	.2160	.2190	.2200	.1889	.1894	.1904
12	..	28	..	.2160	.2185	.2195	.1928	.1933	.1943
14	..	..	20	.2420	.2460	.2470	.2095	.2100	.2110
14	..	..	24	.2420	.2450	.2460	.2149	.2154	.2164

Lead Tolerance

A maximum lead error of plus or minus .0005″ in one inch of thread is permitted.

Angle Tolerance

20 to 56 threads per inch incl. = 30′ plus or minus in ½ angle.

Formulae

Maximum Major Diameter = Basic plus C
Minimum Major Diameter = Maximum minus A

Maximum Pitch Diameter = Minimum plus D
Minimum Pitch Diameter = Basic plus B

In the above formulae:—
A = Major diameter tolerance
B = Amount over basic for minimum pitch diameter
C = A constant to add:
45% of the theoretical truncation to nearest .0005″
D = Pitch diameter tolerance
For values of A, B, C and D see Table 331.

Note

All ground thread machine screw taps are regularly made to the above limits and tolerances unless otherwise specified.

TABLE 330
Special Taps
Cut Thread—American National Form

General

The following tables and formulae are used in determining the limits and tolerances for cut thread taps having special diameter or special pitch or both.

Lead Tolerance

A maximum lead error of plus or minus .003″ in one inch of thread is permitted.

Angle Tolerance

Threads per Inch	Error in Half Angle	Error in Full Angle
4 and coarser	30′ Plus or Minus	45′
4½ to 5½ incl.	35′ Plus or Minus	53′
6 to 9 incl.	40′ Plus or Minus	60′
10 to 28 incl.	45′ Plus or Minus	68′
30 and finer	60′ Plus or Minus	90′

Formulae

Min. Major Dia. = Basic plus (B+C)
Max. Major Dia. = Min. plus A
Min. Pitch Dia. = Basic plus B
Max. Pitch Dia. = Min. plus D

A = Major diameter tolerance
B = Amount minimum pitch diameter is over basic
C = A constant to add:
20% of the theoretical truncation for 2 to 5½ threads per inch
25% for 6 to 80 threads per inch
D = Pitch diameter tolerance

Values for A, B and D

Diameter of Tap Inches	A	B		D	
		36 or More Threads per Inch	34 or Less Threads per Inch	Coarser than N.F.	*N.F. and Finer
0 to .099 incl.	.0015	.0002	.0005	.0010	.0010
.100 to .249 incl.	.0020	.0002	.0005	.0015	.0015
¼ to ⅜ incl.	.0025	.0005	.0005	.0020	.0015
Over ⅜ to ½ incl.	.0030	.0005	.0005	.0025	.0020
Over ½ to ¾ incl.	.0040	.0005	.0005	.0030	.0025
Over ¾ to 1 incl.	.0040	.0010	.0010	.0030	.0025
Over 1 to 1½ incl.	.0045	.0010	.0010	.0035	.0030
Over 1½ to 2 incl.	.0055	.0015	.0015	.0040	.0030
Over 2 to 2½ incl.	.0060	.0015	.0015	.0045	.0035
Over 2½ to 2½ incl.	.0060	.0020	.0020	.0045	.0035
Over 2½ to 3 incl.	.0070	.0020	.0020	.0050	.0035
Over 3	.0070	.0025	.0025	.0055	.0045

Values for C

Threads per Inch	Constant	Threads per Inch	Constant	Threads per Inch	Constant	Threads per Inch	Constant
2	.0217	7	.0077	18	.0030	36	.0015
2½	.0173	8	.0068	20	.0027	40	.0014
3	.0144	9	.0060	22	.0025	48	.0011
3½	.0124	10	.0054	24	.0023	50	.0011
4	.0108	11	.0049	26	.0021	56	.0010
4½	.0096	12	.0045	27	.0020	60	.0009
5	.0087	13	.0042	28	.0019	64	.0008
5½	.0079	14	.0039	30	.0018	72	.0008
6	.0090	16	.0034	32	.0017	80	.0007

For intermediate pitches use constant for next coarser pitch.

Note

*Taps over 1½″ with 10 or more threads per inch have tolerances for N.F. and finer.

TABLE 331

Special Taps

Commercial Ground Thread—American National Form

General

The following tables and formulae are used in determining the limits and tolerances for ground thread taps having special diameter or special pitch or both.

Lead Tolerance

A maximum lead error of plus or minus .0005″ in one inch of thread is permitted.

Angle Tolerance

Threads per Inch	Error in Half Angle
4 to 5½ incl.	20′ Plus or Minus
6 to 9 incl.	25′ Plus or Minus
10 to 56 incl.	30′ Plus or Minus

Formulae

Max. Major Dia. = Basic plus C
Min. Major Dia. = Max. minus A
Max. Pitch Dia. = Min. plus D
Min. Pitch Dia. = Basic plus B

In the above formulae:—

A = Major diameter tolerance
B = Amount over basic for minimum pitch diameter
C = A constant to add:
35% of the theoretical truncation for 4 to 5 threads per inch
40% for 5½ to 12 threads per inch
45% for 13 to 56 threads per inch
To nearest .0005″ for 8 or more threads per inch and to nearest .001″ for less than 8 threads per inch
D = Pitch diameter tolerance

Values for A, B, C and D

Threads per Inch	A	B				C	D
		To ¾″ incl.	Over ¾″ to 1½″ incl.	Over 1½″ to 2¼″ incl.	Over 2¼″		
56	.0010	.0002	.0010	.0015	.0020	.0015	.0010
48	.0010	.0002	.0010	.0015	.0020	.0020	.0010
44	.0010	.0002	.0010	.0015	.0020	.0020	.0010
40	.0010	.0002	.0010	.0015	.0020	.0025	.0010
36	.0010	.0002	.0010	.0015	.0020	.0025	.0010
32	.0010	.0005	.0010	.0015	.0020	.0030	.0010
28	.0010	.0005	.0010	.0015	.0020	.0035	.0010
24	.0010	.0005	.0010	.0015	.0020	.0040	.0010
20	.0010	.0005	.0010	.0015	.0020	.0050	.0010
18	.0010	.0005	.0010	.0015	.0020	.0055	.0010
16	.0010	.0005	.0010	.0015	.0020	.0060	.0010
14	.0010	.0005	.0010	.0015	.0020	.0070	.0010
13	.0010	.0005	.0010	.0015	.0020	.0075	.0010
12	.0010	.0005	.0010	.0015	.0020	.0075	.0010
11	.0010	.0005	.0010	.0015	.0020	.0080	.0011
10	.0015	.0005	.0010	.0015	.0020	.0090	.0011
9	.0015	....	.0010	.0015	.0020	.0100	.0012
8	.0015	....	.0010	.0015	.0020	.0110	.0014
7	.0020	....	.0010	.0015	.0020	.0120	.0015
6	.0020	....	.0010	.0015	.0020	.0140	.0018
5½	.0025	....	....	.0015	.0020	.0160	.0020
5	.0025	....	....	.0015	.0020	.0160	.0020
4½	.0025	....	....	.0015	.0020	.0170	.0020
4	.0025	....	....	.0015	.0020	.0190	.0020

For intermediate pitches use value for next coarser pitch.

TABLE 332
Stove Bolt Taps
Cut Thread—Manufacturers Standard
Thread Limits

Size	Threads per Inch S.B.	Major Diameter			Pitch Diameter		
		Basic	Minimum	Maximum	Basic	Minimum	Maximum
1/8	32	.1250	.1280	.1310	.1080	.1110	.1130
5/32	28	.1630	.1660	.1690	.1440	.1470	.1490
3/16	24	.1950	.1980	.2010	.1730	.1760	.1780
7/32	22	.2220	.2255	.2285	.1980	.2015	.2035
1/4	18	.2500	.2525	.2555	.2240	.2275	.2295
5/16	18	.3125	.3150	.3180	.2764	.2779	.2804
3/8	16	.3750	.3780	.3810	.3344	.3359	.3384
7/16	14	.4375	.4400	.4440	.3911	.3926	.3956
1/2	13	.5000	.5030	.5070	.4500	.4515	.4545

Lead Tolerance
A maximum lead error of plus or minus .003″ in one inch of thread is permitted.

TABLE 333
Straight Boiler and Staybolt Taps
Cut Thread—American National Form
Thread Limits

Size	Threads per Inch National Form	Major Diameter			Pitch Diameter		
		Basic	Minimum	Maximum	Basic	Minimum	Maximum
1/2	12	.5000	.5010	.5040	.4459	.4464	.4489
9/16	12	.5625	.5635	.5665	.5084	.5089	.5114
5/8	12	.6250	.6260	.6290	.5709	.5714	.5739
11/16	12	.6875	.6885	.6925	.6334	.6339	.6369
3/4	12	.7500	.7510	.7550	.6959	.6964	.6994
13/16	12	.8125	.8135	.8175	.7584	.7589	.7619
7/8	12	.8750	.8760	.8800	.8209	.8214	.8244
15/16	12	.9375	.9385	.9425	.8834	.8839	.8869
1	12	1.0000	1.0010	1.0050	.9459	.9464	.9494
1 1/16	12	1.0625	1.0635	1.0675	1.0084	1.0089	1.0119
1 1/8	12	1.1250	1.1265	1.1310	1.0709	1.0714	1.0749
1 3/16	12	1.1875	1.1890	1.1935	1.1334	1.1339	1.1374
1 1/4	12	1.2500	1.2515	1.2560	1.1959	1.1964	1.1999
1 5/16	12	1.3125	1.3140	1.3185	1.2584	1.2589	1.2624
1 3/8	12	1.3750	1.3765	1.3810	1.3209	1.3214	1.3249
1 7/16	12	1.4375	1.4390	1.4435	1.3834	1.3839	1.3874
1 1/2	12	1.5000	1.5015	1.5060	1.4459	1.4464	1.4499
1 5/8	12	1.6250	1.6265	1.6320	1.5709	1.5719	1.5759
1 3/4	12	1.7500	1.7515	1.7570	1.6959	1.6969	1.7009
1 7/8	12	1.8750	1.8765	1.8820	1.8209	1.8219	1.8259
2	12	2.0000	2.0015	2.0070	1.9459	1.9469	1.9509

Lead Tolerance
A maximum lead error of plus or minus .003″ in one inch of thread is permitted.

TABLE 334

Straight Pipe Taps

Cut Thread — American Standard Pipe Form

Thread Limits

Nominal Size Inches	Threads per Inch N.P.S.	Size at Gaging Notch	Pitch Diameter	
			American Std. Pipe	
			Minimum	Maximum
1/8	27	.3748	.3733	.3763
1/4	18	.4899	.4884	.4914
3/8	18	.6270	.6253	.6288
1/2	14	.7784	.7767	.7802
3/4	14	.9889	.9869	.9909
1	11 1/2	1.2386	1.2366	1.2406
1 1/4	11 1/2	1.5834	1.5811	1.5856
1 1/2	11 1/2	1.8223	1.8201	1.8246
2	11 1/2	2.2963	2.2938	2.2988
2 1/2	8	2.7622	2.7594	2.7649
3	8	3.3885	3.3858	3.3913
3 1/2	8	3.8888	3.8861	3.8916
4	8	4.3871	4.3844	4.3899

Lead Tolerance

A maximum lead error of plus or minus .003" in one inch of thread is permitted.

Angle Tolerance

Threads per Inch	Error in Half Angle	Error in Full Angle
8	40′ Plus or Minus	60′
11 1/2 to 27 inclusive	45′ Plus or Minus	68′

(Concluded on following page)

TABLE 334

Straight Pipe Taps

Cut Thread — American Standard Pipe Form

(Concluded)

Formulae for American Standard Pipe Form

(Approximate)

Minimum Major Diameter = Measured pitch diameter plus "A"
Maximum Major Diameter = Measured pitch diameter plus "B"

Minimum Minor Diameter = Measured pitch diameter minus "B"
Maximum Minor Diameter = Measured pitch diameter minus "C"

Minimum Pitch Diameter = Size at gaging notch minus one-half tolerance
Maximum Pitch Diameter = Minimum plus tolerance

Formulae Values

Threads per Inch N.P.S.	A	B	C	D	E
27	.0267	.0296	.0257	.0234	.0251
18	.0408	.0444	.0401	.0377	.0395
14	.0535	.0571	.0525	.0515	.0533
11½	.0658	.0696	.0647	.0615	.0649
8	.0966	.1000	.0946	.....	.....

Note

As the American Standard Pipe Thread Form is to be maintained, the major and minor diameters vary with the Pitch Diameter. Either a flat or a rounded form is allowable at both the crest and root.

TABLE 335

Straight Pipe Taps

Ground Thread — American Standard Pipe Form (NPSC and NPSM)

Thread Limits

Nominal Size Inches	Threads per Inch N.P.S.	Major Diameter			Pitch Diameter		
		Plug at Gaging Notch	Minimum G	Maximum H	Plug at Gaging Notch E	Minimum K	Maximum L
1/8	27	.3994	.4034	.4044	.3748	.3753	.3763
1/4	18	.5269	.5323	.5333	.4899	.4904	.4914
3/8	18	.6640	.6694	.6704	.6270	.6275	.6285
1/2	14	.8260	.8335	.8345	.7784	.7789	.7799
3/4	14	1.0364	1.0440	1.0450	.9889	.9894	.9904
1	11 1/2	1.2966	1.3057	1.3072	1.2386	1.2396	1.2407
1 1/4	11 1/2	1.6413	1.6505	1.6520	1.5834	1.5844	1.5855
1 1/2	11 1/2	1.8803	1.8894	1.8909	1.8223	1.8233	1.8244
2	11 1/2	2.3542	2.3634	2.3649	2.2963	2.2973	2.2984
2 1/2	8	2.8454	2.8597	2.8612	2.7622	2.7632	2.7646
3	8	3.4718	3.4860	3.4875	3.3885	3.3895	3.3909
3 1/2	8	3.9721	3.9863	3.9878	3.8888	3.8898	3.8912
4	8	4.4704	4.4846	4.4861	4.3871	4.3881	4.3895

American Standard Dryseal Pipe Form (NPSF)

Thread Limits

Nominal Size Inches	Threads per Inch N.P.S.F.	Major Diameter		Pitch Diameter			Minor * Diam. Flat Maximum
		Minimum G	Maximum H	Plug at Gaging Notch E	Minimum K	Maximum L	
1/16	27	.3008	.3018	.2812	.2767	.2777	.004
1/8	27	.3932	.3942	.3748	.3691	.3701	.004
1/4	18	.5239	.5249	.4899	.4854	.4864	.005
3/8	18	.6593	.6603	.6270	.6208	.6218	.005
1/2	14	.8230	.8240	.7784	.7707	.7717	.005
3/4	14	1.0335	1.0345	.9889	.9812	.9822	.005
1	11 1/2	1.2933	1.2943	1.2386	1.2294	1.2305	.006

* As specified or sharper.

Note: The major diameter of standard taper pipe plug gages and the minor diameter of standard taper pipe ring gages used for gaging dryseal threads will be truncated .20p minimum or .25p maximum for all pitches.

(Concluded on following page)

TABLE 335

Straight Pipe Taps

Ground Thread — American Standard Pipe Form (NPSC and NPSM)

(Concluded)

Lead Tolerance

A maximum lead error of plus or minus .0005″ in one inch of thread is permitted.

Angle Tolerance

Threads per Inch	Error in Half Angle
8 11½ to 27 inclusive	25′ Plus or Minus 30′ Plus or Minus

Formulae for American Standard Pipe Form (NPSC and NPSM)

Nominal Size Inches	Major Diameter		Minor Diameter		Pitch Diameter	
	Minimum G	Maximum H	Minimum	Maximum	Minimum K	Maximum L
⅛	H − .0010″	(K+A) − .0005″	M − A	M − B	E + .0005″	K + D
¼ to ¾ Incl.	H − .0010″	(K+A) − .0015″	M − A	M − B	E + .0005″	K + D
1 to 4 Incl.	H − .0015″	(K+A) − .0020″	M − A	M − B	E + .0010″	K + D

Formulae for American Standard Dryseal Pipe Form (NPSF)

Nominal Size Inches	Major Diameter		Pitch Diameter		Maximum Minor Diameter
	Minimum G	Maximum H	Minimum K	Maximum L	
1/16	H − .001″	K + Q	L − .0010″	E − F	M − Q
⅛	H − .001″	K + Q	L − .0010″	E − P	M − Q
¼	H − .001″	K + Q	L − .0010″	E − F	M − Q
⅜	H − .001″	K + Q	L − .0010″	E − P	M − Q
½	H − .001″	K + Q	L − .0010″	E − F	M − Q
¾	H − .001″	K + Q	L − .0010″	E − F	M − Q
1	H − .001″	K + Q	L − .0011″	E − F	M − Q

Formulae Values

Threads per Inch	A	B	D	E	F	P	Q
27	.0296″	.0257″	.0010″	Pitch	.0035″	.0047″	.0251″
18	.0444″	.0401″	.0010″	diameter	.0035″	.0052″	.0395″
14	.0571″	.0525″	.0010″	of plug	.0067″	.....	.0533″
11½	.0696″	.0647″	.0011″	at gaging	.0081″	.....	.0649″
8	.1000″	.0946″	.0014″	notch	.....	.....	.....

TABLE 336

Bent Shank Tapper Taps

Class 2

Cut Thread — American National Form

Thread Limits

Size	Threads per Inch		Major Diameter			Pitch Diameter		
	N.C.	N.F.	Basic	Minimum	Maximum	Basic	Minimum	Maximum
1/4	20	..	.2500	.2527	.2552	.2175	.2175	.2195
1/4	..	28	.2500	.2519	.2544	.2268	.2263	.2283
5/16	18	..	.3125	.3155	.3180	.2764	.2764	.2784
5/16	..	24	.3125	.3148	.3173	.2854	.2849	.2869
3/8	16	..	.3750	.3784	.3809	.3344	.3344	.3364
3/8	..	24	.3750	.3768	.3793	.3479	.3469	.3489
7/16	14	..	.4375	.4414	.4444	.3911	.3911	.3936
7/16	..	20	.4375	.4392	.4422	.4050	.4035	.4060
1/2	13	..	.5000	.5042	.5072	.4500	.4500	.4525
1/2	..	20	.5000	.5017	.5047	.4675	.4660	.4685
9/16	12	..	.5625	.5670	.5700	.5084	.5084	.5109
9/16	..	18	.5625	.5645	.5675	.5264	.5249	.5274
5/8	11	..	.6250	.6299	.6329	.5660	.5660	.5685
5/8	..	18	.6250	.6270	.6300	.5889	.5874	.5899
3/4	10	..	.7500	.7554	.7594	.6850	.6850	.6880
3/4	..	16	.7500	.7519	.7559	.7094	.7074	.7104

Lead Tolerance

A maximum lead error of plus or minus .003" in one inch of thread is permitted.

Note

Taps made to the above thread limits will be marked "Class 2" in addition to the regular marking.

TABLE 338

Taper Pipe Taps

Cut and Ground Thread

American Standard Pipe Thread

American Standard Dryseal Pipe Form

Thread Limits

Nominal Size Inches	Threads per Inch N.P.T.	* Gage Measurement—Ins.			Taper per Foot—Inches			
		Projection	Tolerance Plus or Minus		Cut Thread		Ground Thread	
			Cut Thread	Ground Thread	Minimum	Maximum	Minimum	Maximum
1/16	27	.312	1/16	1/16	23/32	27/32	23/32	25/32
1/8	27	.312	1/16	1/16	23/32	27/32	23/32	25/32
1/4	18	.459	1/16	1/16	23/32	27/32	23/32	25/32
3/8	18	.454	1/16	1/16	23/32	27/32	23/32	25/32
1/2	14	.579	1/16	1/16	23/32	13/16	23/32	25/32
3/4	14	.565	1/16	1/16	23/32	13/16	23/32	25/32
1	11 1/2	.678	3/32	3/32	23/32	13/16	23/32	25/32
1 1/4	11 1/2	.686	3/32	3/32	23/32	13/16	23/32	25/32
1 1/2	11 1/2	.699	3/32	3/32	23/32	13/16	23/32	25/32
2	11 1/2	.667	3/32	3/32	23/32	13/16	23/32	25/32
2 1/2	8	.925	3/32	3/32	47/64	51/64	47/64	25/32
3	8	.925	3/32	3/32	47/64	51/64	47/64	25/32
3 1/2	8	.938	1/8	1/8	47/64	51/64	47/64	25/32
4	8	.950	1/8	1/8	47/64	51/64	47/64	25/32

* Distance small end of tap projects through American Standard Pipe Thread Ring Gage.

(Concluded on following page)

TABLE 338

Taper Pipe Taps

Cut and Ground Thread
American Standard Pipe Form
American Standard Dryseal Pipe Form

(Concluded)

Lead Tolerances

Cut Thread = A Maximum lead error of plus or minus .003" in one inch of thread is permitted.

Ground Thread = A Maximum lead error of plus or minus .0005" in one inch of thread is permitted.

Angle Tolerance

Threads per Inch	Tolerance		
	Half Angle		Full Angle
	Cut Thread	Ground Thread	Cut Thread
8 11½ to 27 inclusive	40′ Plus or Minus 45′ Plus or Minus	25′ Plus or Minus 30′ Plus or Minus	60′ 68′

Formulae

Cut and Ground Thread

American Standard Pipe Form

Minimum Major Diameter = Measured pitch diameter plus "A"
Maximum Major Diameter = Measured pitch diameter plus "B"
Minimum Minor Diameter = Measured pitch diameter minus "B"
Maximum Minor Diameter = Measured pitch diameter minus "C"

Ground Thread

American Standard Dryseal Pipe Form

Minimum Major Diameter = Measured pitch diameter plus "D"
Maximum Major Diameter = Measured pitch diameter plus "E"
Minimum Minor Diameter = Maximum or smaller
Maximum Minor Diameter = Measured pitch diameter minus "E"

Formulae Values

Threads per Inch	A	B	C	D	E
27	.0267	.0296	.0257	.0234	.0251
18	.0408	.0444	.0401	.0377	.0395
14	.0535	.0571	.0525	.0515	.0533
11½	.0658	.0696	.0647	.0614	.0649
8	.0966	.1000	.0946	.....	.....

Note

For essential dimensions of American Standard Pipe Threads, see Table 357.

TABLE 339

Bent Shank Tapper Taps

for Tapping Free Fit

Cut Thread — American National Coarse

Thread Limits

Size	Threads per Inch	Major Diameter			Pitch Diameter		
		Basic	Minimum	Maximum	Basic	Minimum	Maximum
1/4	20	.2500	.2542	.2567	.2175	.2190	.2210
5/16	18	.3125	.3170	.3195	.2764	.2779	.2799
3/8	16	.3750	.3799	.3824	.3344	.3359	.3379
7/16	14	.4375	.4429	.4459	.3911	.3926	.3951
1/2	13	.5000	.5057	.5087	.4500	.4515	.4540
9/16	12	.5625	.5685	.5715	.5084	.5099	.5124
5/8	11	.6250	.6314	.6344	.5660	.5675	.5700
3/4	10	.7500	.7569	.7609	.6850	.6865	.6895

Lead Tolerance

A maximum lead error of plus or minus .003″ in one inch of thread is permitted.

TABLE 340

Taper Pipe Taps

Cut and Ground Thread — British Standard Form

American Tap Manufacturers' Practice

Thread Limits and Tolerances

Nominal Size Inches	Thrds. per Inch B.S.P.	*Gage Measurement Inches			Lead Tolerance per Inch of Thread Plus or Minus Inches		Angle Tolerance			Taper per Foot Plus or Minus Inches	
			Tolerance Plus or Minus				Half Angle Plus or Minus		Full Angle		
		Projection	†C.T.	‡G.T.	†C.T.	‡G.T.	†C.T.	‡G.T.	†C.T.	†C.T.	‡G.T.
1/8	28	.286	1/16	1/16	.003	.0005	45′	30′	68′	1/16	1/32
1/4	19	.391	1/16	1/16	.003	.0005	45′	30′	68′	1/16	1/32
3/8	19	.391	1/16	1/16	.003	.0005	45′	30′	68′	1/16	1/32
1/2	14	.509	1/16	1/16	.003	.0005	45′	30′	68′	1/16	1/32
3/4	14	.509	1/16	1/16	.003	.0005	45′	30′	68′	1/16	1/32
1	11	.662	3/32	3/32	.003	.0005	45′	30′	68′	1/16	1/32
1 1/4	11	.662	3/32	3/32	.003	.0005	45′	30′	68′	1/16	1/32
1 1/2	11	.662	3/32	3/32	.003	.0005	45′	30′	68′	1/16	1/32
2	11	.707	3/32	3/32	.003	.0005	45′	30′	68′	1/16	1/32
2 1/2	11	.776	3/32	3/32	.003	.0005	45′	30′	68′	1/16	1/32
3	11	.776	3/32	3/32	.003	.0005	45′	30′	68′	1/16	1/32
3 1/2	11	.807	1/8	1/8	.003	.0005	45′	30′	68′	1/16	1/32
4	11	.852	1/8	1/8	.003	.0005	45′	30′	68′	1/16	1/32

† = Cut Thread ‡ = Ground Thread

*Distance small end of tap projects through British Standard Pipe Thread Ring Gage.

Formulae

The maximum error in radius at the crest and root of thread shall not exceed .03 pitch or:

Plus or minus .001″ on 28 threads per inch
.0016″ on 19 threads per inch
.0021″ on 14 threads per inch
.0027″ on 11 threads per inch

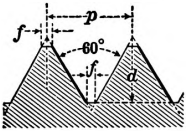
Note

For essential dimensions of British Standard Form Pipe Threads, see Table 358.

TABLE 351

Basic Thread Dimensions and Tap Drill Sizes

Fractional Sizes—American National Form



Formula $\begin{cases} p = \text{pitch} = \dfrac{1}{\text{No. thds. per in.}} \\ d = \text{depth} = p \times .64952 \\ f = \text{flat} = \dfrac{p}{8} \end{cases}$

Nominal Size	Major Diameter Inches	Pitch Diameter Inches	Root Diameter Inches	Commercial Tap Drill to Produce Approx. 75% Full Thread	Decimal Equivalent of Tap Drill
1/16–64	.0625	.0524	.0422	3/64	.0469
72	.0625	.0535	.0445	3/64	.0469
5/64–60	.0781	.0673	.0563	1/16	.0625
72	.0781	.0691	.0601	52	.0635
3/32–48	.0938	.0803	.0667	49	.0730
50	.0938	.0808	.0678	49	.0730
7/64–48	.1094	.0959	.0823	43	.0890
1/8–32	.1250	.1047	.0844	3/32	.0937
40	.1250	.1088	.0925	38	.1015
9/64–40	.1406	.1244	.1081	32	.1160
5/32–32	.1563	.1360	.1157	1/8	.1250
36	.1563	.1382	.1202	30	.1285
11/64–32	.1719	.1516	.1313	9/64	.1406
3/16–24	.1875	.1604	.1334	26	.1470
32	.1875	.1672	.1469	22	.1570
13/64–24	.2031	.1760	.1490	20	.1610
7/32–24	.2188	.1917	.1646	16	.1770
32	.2188	.1985	.1782	12	.1890
15/64–24	.2344	.2073	.1806	10	.1935
1/4–20	.2500	.2175	.1850	7	.2010
24	.2500	.2229	.1959	4	.2090
27	.2500	.2260	.2019	3	.2130
28	.2500	.2268	.2036	3	.2130
32	.2500	.2297	.2094	7/32	.2188

(Continued on following page)

TABLE 351

Basic Thread Dimensions and Tap Drill Sizes

Fractional Sizes—American National Form

(Continued)

Nominal Size	Major Diameter Inches	Pitch Diameter Inches	Root Diameter Inches	Commercial Tap Drill to Produce Approx. 75% Full Thread	Decimal Equivalent of Tap Drill
5/16–18	.3125	.2764	.2403	F	.2570
20	.3125	.2800	.2476	17/64	.2656
24	.3125	.2854	.2584	I	.2720
27	.3125	.2884	.2644	J	.2770
32	.3125	.2922	.2719	9/32	.2812
3/8–16	.3750	.3344	.2938	5/16	.3125
20	.3750	.3425	.3100	21/64	.3281
24	.3750	.3479	.3209	Q	.3320
27	.3750	.3509	.3269	R	.3390
7/16–14	.4375	.3911	.3447	U	.3680
20	.4375	.4050	.3726	25/64	.3906
24	.4375	.4104	.3834	X	.3970
27	.4375	.4134	.3894	Y	.4040
1/2–12	.5000	.4459	.3918	27/64	.4219
13	.5000	.4500	.4001	27/64	.4219
20	.5000	.4675	.4351	29/64	.4531
24	.5000	.4729	.4459	29/64	.4531
27	.5000	.4759	.4519	15/32	.4687
9/16–12	.5625	.5084	.4542	31/64	.4844
18	.5625	.5264	.4903	33/64	.5156
27	.5625	.5384	.5144	17/32	.5312
5/8–11	.6250	.5660	.5069	17/32	.5312
12	.6250	.5709	.5168	35/64	.5469
18	.6250	.5889	.5528	37/64	.5781
27	.6250	.6009	.5769	19/32	.5937
11/16–11	.6875	.6285	.5694	19/32	.5937
16	.6875	.6469	.6063	5/8	.6250
3/4–10	.7500	.6850	.6201	21/32	.6562
12	.7500	.6959	.6418	43/64	.6719
16	.7500	.7094	.6688	11/16	.6875
27	.7500	.7259	.7019	23/32	.7187
13/16–10	.8125	.7476	.6826	23/32	.7187

(Concluded on following page)

TABLE 351

Basic Thread Dimensions and Tap Drill Sizes

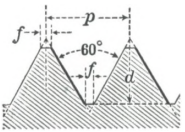
Fractional Sizes—American National Form
(Concluded)

Nominal Size	Major Diameter Inches	Pitch Diameter Inches	Root Diameter Inches	Commercial Tap Drill to Produce Approx. 75% Full Thread	Decimal Equivalent of Tap Drill
7/8 – 9	.8750	.8028	.7307	49/64	.7656
12	.8750	.8209	.7668	51/64	.7969
14	.8750	.8286	.7822	13/16	.8125
18	.8750	.8389	.8028	53/64	.8281
27	.8750	.8509	.8269	27/32	.8437
15/16 – 9	.9375	.8654	.7932	53/64	.8281
1 – 8	1.0000	.9188	.8376	7/8	.8750
12	1.0000	.9459	.8918	59/64	.9219
14	1.0000	.9536	.9072	15/16	.9375
27	1.0000	.9759	.9519	31/32	.9687
1 1/8 – 7	1.1250	1.0322	.9394	63/64	.9844
12	1.1250	1.0709	1.0168	1 3/64	1.0469
1 1/4 – 7	1.2500	1.1572	1.0644	1 7/64	1.1094
12	1.2500	1.1959	1.1418	1 11/64	1.1719
1 3/8 – 6	1.3750	1.2667	1.1585	1 7/32	1.2187
12	1.3750	1.3209	1.2668	1 19/64	1.2969
1 1/2 – 6	1.5000	1.3917	1.2835	1 11/32	1.3437
12	1.5000	1.4459	1.3918	1 27/64	1.4219
1 5/8 – 5 1/2	1.6250	1.5069	1.3888	1 29/64	1.4531
1 3/4 – 5	1.7500	1.6201	1.4902	1 9/16	1.5625
1 7/8 – 5	1.8750	1.7451	1.6152	1 11/16	1.6875
2 – 4 1/2	2.0000	1.8557	1.7113	1 25/32	1.7812
2 1/8 – 4 1/2	2.1250	1.9807	1.8363	1 29/32	1.9062
2 1/4 – 4 1/2	2.2500	2.1057	1.9613	2 1/32	2.0312
2 3/8 – 4	2.3750	2.2126	2.0502	2 1/8	2.1250
2 1/2 – 4	2.5000	2.3376	2.1752	2 1/4	2.2500
2 3/4 – 4	2.7500	2.5876	2.4252	2 1/2	2.5000
3 – 4	3.0000	2.8376	2.6752	2 3/4	2.7500
3 1/4 – 4	3.2500	3.0876	2.9252	3	3.0000
3 1/2 – 4	3.5000	3.3376	3.1752	3 1/4	3.2500
3 3/4 – 4	3.7500	3.5876	3.4252	3 1/2	3.5000
4 – 4	4.0000	3.8376	3.6752	3 3/4	3.7500

TABLE 352

Basic Thread Dimensions and Tap Drill Sizes

Machine Screw Sizes—American National Form



$$\text{Formula} \begin{cases} p = \text{pitch} = \dfrac{1}{\text{No. thds. per in.}} \\ d = \text{depth} = p \times .64952 \\ f = \text{flat} = \dfrac{p}{8} \end{cases}$$

Screw Gage No.	Major Diameter Inches	Pitch Diameter Inches	Root Diameter Inches	Commercial Tap Drill to Produce Approx. 75% Full Thread	Decimal Equivalent of Tap Drill
0–80	.0600	.0519	.0438	3/64	.0469
1–56	.0730	.0614	.0498	54	.0550
64	.0730	.0629	.0527	53	.0595
72	.0730	.0640	.0550	53	.0595
2–56	.0860	.0744	.0628	50	.0700
64	.0860	.0759	.0657	50	.0700
3–48	.0990	.0855	.0719	47	.0785
56	.0990	.0874	.0758	45	.0820
4–32	.1120	.0917	.0714	45	.0820
36	.1120	.0940	.0759	44	.0860
40	.1120	.0958	.0795	43	.0890
48	.1120	.0985	.0849	42	.0935
5–36	.1250	.1070	.0889	40	.0980
40	.1250	.1088	.0925	38	.1015
44	.1250	.1102	.0955	37	.1040
6–32	.1380	.1177	.0974	36	.1065
36	.1380	.1200	.1019	34	.1110
40	.1380	.1218	.1055	33	.1130
7–30	.1510	.1294	.1077	31	.1200
32	.1510	.1307	.1104	31	.1200
36	.1510	.1330	.1149	1/8	.1250

(Concluded on following page)

TABLE 352

Basic Thread Dimensions and Tap Drill Sizes

Machine Screw Sizes—American National Form

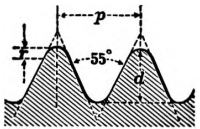
(Concluded)

Screw Gage No.	Major Diameter Inches	Pitch Diameter Inches	Root Diameter Inches	Commercial Tap Drill to Produce Approx. 75% Full Thread	Decimal Equivalent of Tap Drill
8–30	.1640	.1423	.1207	30	.1285
32	.1640	.1437	.1234	29	.1360
36	.1640	.1460	.1279	29	.1360
40	.1640	.1478	.1315	28	.1405
9–24	.1770	.1499	.1229	29	.1360
30	.1770	.1553	.1337	27	.1440
32	.1770	.1567	.1364	26	.1470
10–24	.1900	.1629	.1359	25	.1495
28	.1900	.1668	.1436	23	.1540
30	.1900	.1684	.1467	22	.1570
32	.1900	.1697	.1494	21	.1590
12–24	.2160	.1889	.1619	16	.1770
28	.2160	.1928	.1696	14	.1820
32	.2160	.1957	.1754	13	.1850
14–20	.2420	.2095	.1770	10	.1935
24	.2420	.2149	.1879	7	.2010
16–18	.2680	.2319	.1958	3	.2130
20	.2680	.2355	.2030	7/32	.2187
22	.2680	.2385	.2090	2	.2210
18–18	.2940	.2579	.2218	B	.2380
20	.2940	.2615	.2290	D	.2460
20–16	.3200	.2794	.2388	G	.2610
18	.3200	.2839	.2478	17/64	.2656
20	.3200	.2875	.2550	I	.2720
22–16	.3460	.3054	.2648	9/32	.2812
18	.3460	.3099	.2738	L	.2900
24–16	.3720	.3314	.2908	5/16	.3125
18	.3720	.3359	.2998	O	.3160
26–14	.3980	.3516	.3052	21/64	.3281
16	.3980	.3574	.3168	R	.3390
28–14	.4240	.3776	.3312	T	.3580
16	.4240	.3834	.3428	23/64	.3594
30–14	.4500	.4036	.3572	V	.3770
16	.4500	.4094	.3688	25/64	.3906

TABLE 353

Basic Thread Dimensions and Tap Drill Sizes

British Standard—Whitworth Form



Formula
$$p = \text{pitch} = \frac{1}{\text{No. thds. per in.}}$$
$$d = \text{depth} = p \times .64033$$
$$r = \text{radius} = p \times .1373$$

Nominal Size	Major Diameter Inches	Pitch Diameter Inches	Root Diameter Inches	Commercial Tap Drill to Produce Approx. Full Thread	Decimal Equivalent of Drill
1/16–60	.0625	.0518	.0412	57	.0430
3/32–48	.0938	.0804	.0671	50	.0700
1/8–40	.1250	.1090	.0930	40	.0980
5/32–32	.1563	.1362	.1162	31	.1200
3/16–24	.1875	.1608	.1341	28	.1405
7/32–24	.2188	.1921	.1654	17	.1730
1/4–20	.2500	.2180	.1860	9	.1960
26	.2500	.2254	.2001	4	.2090
9/32–26	.2813	.2566	.2321	C	.2420
5/16–18	.3125	.2769	.2414	1/4	.2500
22	.3125	.2834	.2543	G	.2610
3/8–16	.3750	.3350	.2950	5/16	.3125
20	.3750	.3430	.3110	P	.3230
7/16–14	.4375	.3918	.3460	T	.3580
18	.4375	.4019	.3665	3/8	.3750
1/2–12	.5000	.4466	.3933	Z	.4130
16	.5000	.4600	.4200	7/16	.4375
9/16–12	.5625	.5091	.4558	15/32	.4687
16	.5625	.5225	.4825	1/2	.5000
5/8–11	.6250	.5668	.5086	17/32	.5312
14	.6250	.5793	.5336	35/64	.5469
11/16–11	.6875	.6293	.5711	19/32	.5937
14	.6875	.6418	.5961	39/64	.6094

(Concluded on following page)

TABLE 353

Basic Thread Dimensions and Tap Drill Sizes

British Standard—Whitworth Form

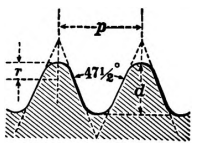
(Concluded)

Nominal Size	Major Diameter Inches	Pitch Diameter Inches	Root Diameter Inches	Commercial Tap Drill to Produce Approx. Full Thread	Decimal Equivalent of Drill
3/4–10	.7500	.6860	.6219	41/64	.6406
12	.7500	.6966	.6434	21/32	.6562
13/16–10	.8125	.7485	.6844	45/64	.7031
12	.8125	.7591	.7059	23/32	.7187
7/8– 9	.8750	.8039	.7327	3/4	.7500
11	.8750	.8168	.7586	25/32	.7812
15/16– 9	.9375	.8664	.7952	13/16	.8125
1 – 8	1.0000	.9200	.8399	55/64	.8593
10	1.0000	.9360	.8720	57/64	.8906
1 1/8– 7	1.1250	1.0335	.9420	31/32	.9687
9	1.1250	1.0539	.9828	1	1.0000
1 1/4– 7	1.2500	1.1585	1.0670	1 3/32	1.0937
9	1.2500	1.1789	1.1078	1 1/8	1.1250
1 3/8– 6	1.3750	1.2683	1.1616	1 3/16	1.1875
8	1.3750	1.2950	1.2150	1 15/64	1.2343
1 1/2– 6	1.5000	1.3933	1.2866	1 5/16	1.3125
8	1.5000	1.4200	1.3400	1 3/8	1.3750
1 5/8– 5	1.6250	1.4969	1.3689	1 13/32	1.4062
1 3/4– 5	1.7500	1.6219	1.4939	1 17/32	1.5312
1 7/8– 4 1/2	1.8750	1.7327	1.5904	1 5/8	1.6250
2 – 4 1/2	2.0000	1.8577	1.7154	1 3/4	1.7500
2 1/8– 4 1/2	2.1250	1.9827	1.8404	1 7/8	1.8750
2 1/4– 4	2.2500	2.0899	1.9298	1 31/32	1.9687
2 3/8– 4	2.3750	2.2149	2.0548	2 3/32	2.0937
2 1/2– 4	2.5000	2.3399	2.1798	2 7/32	2.2187
2 3/4– 3 1/2	2.7500	2.5671	2.3841	2 7/16	2.4375
3 – 3 1/2	3.0000	2.8171	2.6341	2 11/16	2.6875
3 1/4– 3 1/4	3.2500	3.0530	2.8560	2 7/8	2.8750
3 1/2– 3 1/4	3.5000	3.3030	3.1060	3 1/8	3.1250
3 3/4– 3	3.7500	3.5366	3.3231	3 3/8	3.3750
4 – 3	4.0000	3.7866	3.5731	3 5/8	3.6250

TABLE 354

Basic Thread Dimensions and Tap Drill Sizes

British Association Standard



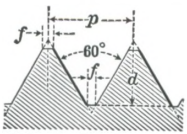
Formula
p = pitch
d = depth $= p \times .6$
r = radius $= \frac{2 \times p}{11}$

Number	Pitch m/m	Major Diameter m/m	Pitch Diameter m/m	Root Diameter m/m	Commercial Tap Drill to Produce Approximately Full Thread
0	1.00	6.0	5.400	4.80	10
1	.90	5.3	4.760	4.22	17
2	.81	4.7	4.215	3.73	24
3	.73	4.1	3.660	3.22	29
4	.66	3.6	3.205	2.81	32
5	.59	3.2	2.845	2.49	37
6	.53	2.8	2.480	2.16	43
7	.48	2.5	2.210	1.92	46
8	.43	2.2	1.940	1.68	50
9	.39	1.9	1.665	1.43	53
10	.35	1.7	1.490	1.28	55
11	.31	1.5	1.315	1.13	56
12	.28	1.3	1.130	.96	60
14	.23	1.0	.860	.72	70

TABLE 355

Basic Thread Dimensions and Tap Drill Sizes

French and International Standard



Formula $\begin{cases} p = \text{pitch} \\ d = \text{depth} = p \times .64952 \\ f = \text{flat} = \frac{p}{8} \end{cases}$

Nominal Diameter m/m	Pitch m/m			Pitch Diameter m/m	Root Diameter m/m	Commercial Tap Drill to Produce Approx. 75% Full Thread
	French Std.	International Std. (D. I. N.)	Optional			
1.5	.35	...	...	1.273	1.05	1.1
2	...	.40	...	1.740	1.48	1.6
2	.45	...	...	1.708	1.42	1.5
2	...	...	.50	1.675	1.35	1.5
2.3	...	.40	...	2.040	1.78	1.9
2.5	.45	...	...	2.208	1.92	2.0
2.6	...	.45	...	2.308	2.02	2.1
3	...	.50	...	2.675	2.35	2.5
3	.60	...	...	2.610	2.22	2.4
3	...	...	.75	2.513	2.03	2.25
3.5	.60	.60	...	3.110	2.72	2.9
4	...	.70	...	3.545	3.09	3.3
4	.75	...	...	3.513	3.03	3.25
4.5	.75	.75	...	4.013	3.53	3.75
5	...	...	.75	4.513	4.03	4.25
5	...	.80	...	4.480	3.96	4.2
5	.90	...	...	4.415	3.83	4.1
5	...	...	1.00	4.350	3.70	4.0
5.5	...	...	.75	5.013	4.53	4.75
5.5	.90	.90	...	4.915	4.33	4.6
6	1.00	1.00	...	5.350	4.70	5.0
6	...	...	1.25	5.188	4.38	4.8
7	1.00	1.00	...	6.350	5.70	6.0
7	...	...	1.25	6.188	5.38	5.8
8	1.00	...	...	7.350	6.70	7.0
8	...	1.25	...	7.188	6.38	6.8
9	1.00	...	...	8.350	7.70	8.0
9	...	1.25	...	8.188	7.38	7.8
10	...	...	1.25	9.188	8.38	8.8
10	1.50	1.50	...	9.026	8.05	8.6
11	...	1.50	...	10.026	9.05	9.6

(Concluded on following page)

TABLE 355

Basic Thread Dimensions and Tap Drill Sizes

French and International Standard

(Concluded)

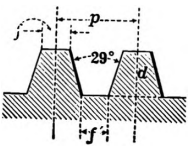
Nominal Diameter m/m	Pitch m/m			Pitch Diameter m/m	Root Diameter m/m	Commercial Tap Drill to Produce Approx. 75% Full Thread
	French Std.	International Std. (D. I. N.)	Optional			
12	...	...	1.25	11.188	10.38	11.0
12	1.50	...	...	11.026	10.05	10.5
12	...	1.75	...	10.863	9.73	10.5
13	...	...	1.50	12.026	11.05	11.5
13	...	...	1.75	11.863	10.73	11.5
13	...	...	2.00	11.701	10.40	11.0
14	...	...	1.25*	13.188	12.38	13.0
14	...	...	1.75	12.863	11.73	12.5
14	2.00	2.00	...	12.701	11.40	12.0
15	...	...	1.75	13.863	12.73	13.5
15	...	...	2.00	13.701	12.40	13.0
16	2.00	2.00	...	14.701	13.40	14.0
17	...	...	2.00	15.701	14.40	15.0
18	...	...	1.50*	17.026	16.05	16.5
18	...	...	2.00	16.701	15.40	16.0
18	2.50	2.50	...	16.376	14.75	15.5
19	...	...	2.50	17.376	15.75	16.5
20	...	...	2.00	18.701	17.40	18.0
20	2.50	2.50	...	18.376	16.75	17.5
22	2.50	2.50	...	20.376	18.75	19.5
24	3.00	3.00	...	22.051	20.10	21.0
26	3.00	...	...	24.051	22.10	23.0
27	...	3.00	...	25.051	23.10	24.0
28	3.00	...	...	26.051	24.10	25.0
30	3.50	3.50	...	27.727	25.45	26.5
32	3.50	...	...	29.727	27.45	28.5
33	...	3.50	...	30.727	28.45	29.5
34	3.50	...	...	31.727	29.45	30.5
36	4.00	4.00	...	33.402	30.80	32.0
38	4.00	...	...	35.402	32.80	34.0
39	...	4.00	...	36.402	33.80	35.0
40	4.00	...	...	37.402	34.80	36.0
42	4.50	4.50	...	39.077	36.15	37.0
44	4.50	...	...	41.077	38.15	39.0
45	...	4.50	...	42.077	39.15	40.0
46	4.50	...	...	43.077	40.15	41.0
48	5.00	5.00	...	44.752	41.50	43.0
50	5.00	...	...	46.752	43.50	45.0

*Spark Plug Sizes.

TABLE 356

Basic Thread Dimensions

American National Acme Screw Thread



Symbols:

d = Depth of thread with clearance
D = { Tap Drill / Minor diameter of nut
f = Width of flat at top of thread
f' = Width of flat at bottom of space
n = Number of threads per inch
p = Pitch of thread
R = Minor diameter of screw
S = Major diameter of screw
T = Major diameter of tap

Formulae
(Approximate)

$$p = \frac{1}{n} \qquad f = \frac{.3707}{n}$$

$$D = \text{S-p} \qquad R = \text{S-2d}$$

For 10 or less threads per inch

$d = \frac{p}{2}$ plus .010

$f' = \frac{.3707}{n}$ minus .0052

T = S plus .020

For more than 10 threads per inch

$d = \frac{p}{2}$ plus .005

$f' = \frac{.3707}{n}$ minus .0026

T = S plus .010

Table of Thread Parts

Pitch (p)	Threads per Inch (n)	Depth of Thread with Clearance (d)	Flat at Top of Thread (f)	Flat at Bottom of Space (f')	Space at Top of Thread	Thickness at Root of Thread
1	1	.5100	.3707	.3655	.6293	.6345
3/4	1-1/3	.3850	.2780	.2728	.4720	.4772
1/2	2	.2600	.1854	.1802	.3146	.3198
1/3	3	.1767	.1236	.1184	.2097	.2149
1/4	4	.1350	.0927	.0875	.1573	.1625
1/5	5	.1100	.0741	.0689	.1259	.1311
1/6	6	.0933	.0618	.0566	.1049	.1101
1/7	7	.0814	.0530	.0478	.0899	.0951
1/8	8	.0725	.0463	.0411	.0787	.0839
1/9	9	.0655	.0412	.0360	.0699	.0751
1/10	10	.0600	.0371	.0319	.0629	.0681
1/12	12	.0467	.0309	.0283	.0524	.0550
1/14	14	.0407	.0265	.0239	.0449	.0475
1/16	16	.0363	.0232	.0206	.0393	.0419

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TABLE 356

Basic Thread Dimensions

American National Acme Screw Thread

(Concluded)

General Purpose Series

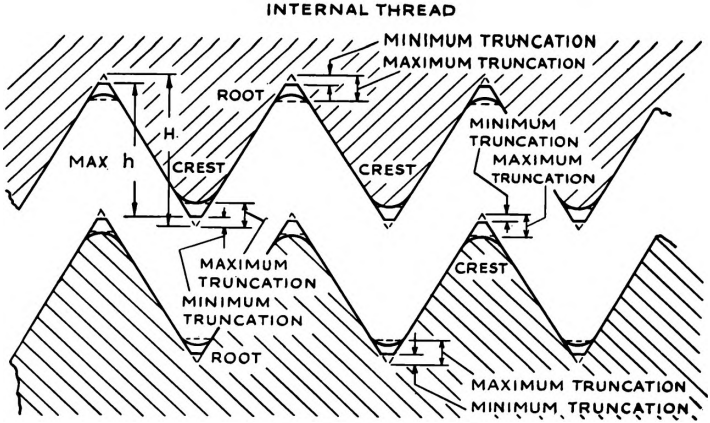
These Acme threads are designated by N. S. T. C. as standard. There are a number of reasons which make it both economical and advantageous to adopt Acme screws from this table. For example, all items ½" and larger have pitches which permit the use of evenly graduated dials on lead screws. Helix angles are 5° or less, making for ease of manufacture. Threads are strong in proportion to diameters.

If a greater lead is required on a given diameter than the thread recommended it is advisable to use a multiple thread of that lead rather than a single thread of that pitch.

Size Inches	Threads per Inch (N)	Basic Dimensions			Thread Data			
		Major Diameter (S)	Pitch Diameter	Minor Diameter (D)	Thickness at Pitch Line (p/2)	Depth Thread with Clearance (d)	Basic Width of Flat (f)	Helix Angle at Pitch Diam.
¼	16	.2500	.2188	.1875	.0313	.0363	.0232	5° 12′
5/16	14	.3125	.2768	.2411	.0357	.0407	.0265	4° 42′
⅜	12	.3750	.3333	.2917	.0417	.0467	.0309	4° 33′
7/16	12	.4375	.3958	.3542	.0417	.0467	.0309	3° 50′
½	10	.5000	.4500	.4000	.0500	.0600	.0371	4° 3′
5/8	8	.6250	.5625	.5000	.0625	.0725	.0463	4° 3′
¾	8	.7500	.6875	.6250	.0625	.0725	.0463	3° 19′
⅞	8	.8750	.8125	.7500	.0625	.0725	.0463	2° 48′
1	5	1.0000	.9000	.8000	.1000	.1100	.0741	4° 3′
1⅛	5	1.1250	1.0250	.9250	.1000	.1100	.0741	3° 33′
1¼	5	1.2500	1.1500	1.0500	.1000	.1100	.0741	3° 10′
1⅜	5	1.3750	1.2750	1.1750	.1000	.1100	.0741	2° 52′
1½	4	1.5000	1.3750	1.2500	.1250	.1350	.0927	3° 19′
1¾	4	1.7500	1.6250	1.5000	.1250	.1350	.0927	2° 48′
2	4	2.0000	1.8750	1.7500	.1250	.1350	.0927	2° 26′
2½	2	2.5000	2.2500	2.0000	.2500	.2600	.1854	4° 3′
3	2	3.0000	2.7500	2.5000	.2500	.2600	.1854	3° 19′
4	2	4.0000	3.7500	3.5000	.2500	.2600	.1854	2° 26′
5	2	5.0000	4.7500	4.5000	.2500	.2600	.1854	1° 55′

TABLE 357

American Standard Pipe Threads



Limits on Crest and Root of American Standard External and Internal Taper Pipe Thread

Threads per Inch	Depth Sharp V Thread Inches H	Depth Pipe Thread "Max." Inches h	Truncation Inches		Equivalent Width of Flat Inches	
			Minimum	Maximum	Minimum	Maximum
27	.03208	.02963	.0012	.0036	.0014	.0041
18	.04811	.04444	.0018	.0049	.0021	.0057
14	.06186	.05714	.0024	.0056	.0027	.0064
11½	.07531	.06957	.0029	.0063	.0033	.0073
8	.10825	.10000	.0041	.0078	.0048	.0090

The limits specified above are intended to serve as a guide for establishing limits of the thread elements of taps, dies and thread chasers. These limits may be required on the product.

The Army-Navy Aeronautical Specifications AN-GG-P-363 agrees with all values given in this table, except those for the maximum truncation and maximum width of flat for the ⅛ inch size, 27 thread. These values are respectively .0027 inch and .0031 inch.

For complete specifications see latest edition of ASA Pamphlet B.2-1.

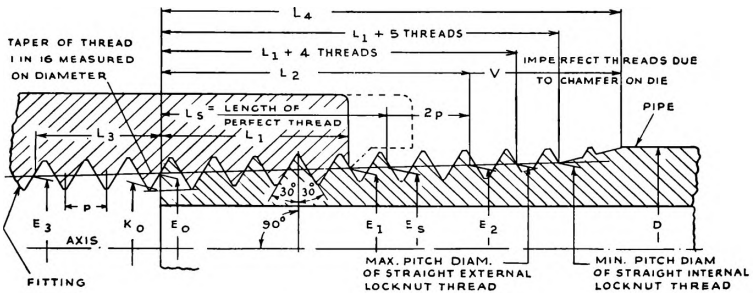
(Continued on following page)

TABLE 357

American Standard and Dryseal Pipe Threads

(Continued)

Dimensional Symbols



n = number of threads per inch

Maximum depth of pipe thread $= \frac{.8}{n}$

Basic major diameter of plug gage = E_1 plus $\frac{.666}{n}$

Basic minor diameter of ring gage = E_1 minus $\frac{.666}{n}$

E_1 is the basic pitch diameter for straight pipe threads

Minimum pitch diameter of straight internal locknut thread = E_1 plus $\frac{.3125}{n}$

Maximum pitch diameter of straight external locknut thread = E_1 plus $\frac{.250}{n}$

(Concluded on following page)

TABLE 357 • American Standard and Dryseal Pipe Threads — (Concluded)

Basic Dimensions — Taper Thread

Nominal Pipe Size Inches	Outside Diameter of Pipe Inches	Threads per Inch	Pitch of Thread	Pitch Diameter at Gaging Notch Basic Inches	Thickness of American Std. Thin Ring Gage and Distance from Small End to Gaging Notch—Inches	Effective Thread External Inches	Wrench Take Up Inches	Total Length of Thread Inches	Pitch Diameter at Small End of Internal Effective Thread Inches	Pitch Diameter at End of Pipe Inches	Minor Diameter at End of Pipe Inches	* Tap Drill Size
	D	n	p	E_1	L_1	L_2	L_3	L_4	E_3	E_0	K_0	
1/16	.3125	27	.03704	.28118	.160	.2611	.1111	.3896	.26424	.27118	.2416	...
1/8	.405	27	.03704	.37476	.180	.2639	.1111	.3924	.35656	.36351	.3339	R
1/4	.540	18	.05556	.48989	.200	.4018	.1667	.5946	.46697	.47739	.4329	7/16
3/8	.675	18	.05556	.62701	.240	.4078	.1667	.6006	.60160	.61201	.5676	37/64
1/2	.840	14	.07143	.77843	.320	.5337	.2143	.7815	.74504	.75843	.7013	23/32
3/4	1.050	14	.07143	.98887	.339	.5457	.2143	.7935	.95429	.96768	.9105	59/64
1	1.315	11½	.08696	1.23863	.400	.6828	.2609	.9845	1.19733	1.21363	1.1441	1 5/32
1¼	1.660	11½	.08696	1.58338	.420	.7068	.2609	1.0085	1.54083	1.55713	1.4876	1 1/2
1½	1.900	11½	.08696	1.82234	.420	.7235	.2609	1.0252	1.77978	1.79609	1.7265	1 47/64
2	2.375	11½	.08696	2.29627	.436	.7565	.2609	1.0582	2.25272	2.26902	2.1995	2 7/32
2**	2.375	11½	.08696	2.29627	.668	.9884	....	1.2901	....	....	....	....
2½	2.875	8	.12500	2.76216	.682	1.1375	.250	1.5713	2.70391	2.71953	2.6195	2 5/8
3	3.500	8	.12500	3.38850	.766	1.2000	.250	1.6337	3.32500	3.34062	3.2406	3 1/4
3½	4.000	8	.12500	3.88881	.821	1.2500	.250	1.6837	3.82188	3.83750	3.7375	3 3/4
4	4.500	8	.12500	4.38712	.844	1.3000	.250	1.7337	4.31875	4.33438	4.2344	4 1/4
5	5.563	8	.12500	5.44929	.937	1.4063	.250	1.8407	5.37511	5.39073	5.2907	....
6	6.625	8	.12500	6.50597	.958	1.5125	.250	1.9467	6.43047	6.44609	6.3461	....
8	8.625	8	.12500	8.50003	1.063	1.7125	.250	2.1467	8.41797	8.43359	8.3336	....
10	10.750	8	.12500	10.62094	1.210	1.9250	.250	2.3587	10.52969	10.54531	10.4453	....
12	12.750	8	.12500	12.61781	1.360	2.1250	.250	2.5587	12.51719	12.53281	12.3428	....

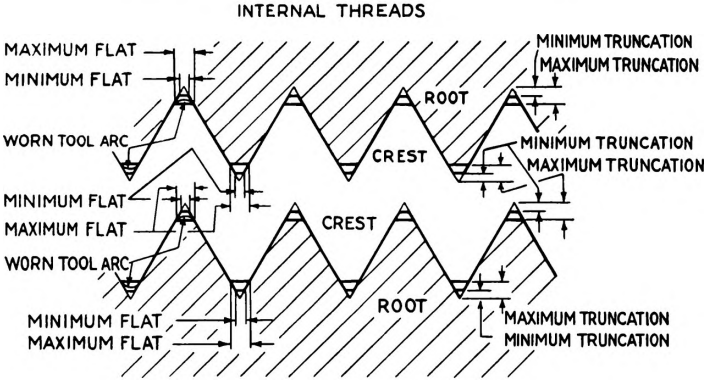
* Methods of inspection vary. Care should be taken to use a tap drill or taper reamer which can meet thread specifications. Sizes given permit direct tapping without reaming the hole, but only give a full thread for the first two or three threads. See columns K_0 and L_3.

** A.P.I. line pipe. This is the only size line pipe that differs in length from the American Standard. Shown for reference only.

TABLE 357

(Concluded)

American Standard Dryseal Pipe Threads



Limits Crest and on Root of American Dryseal External and Internal Pipe Threads

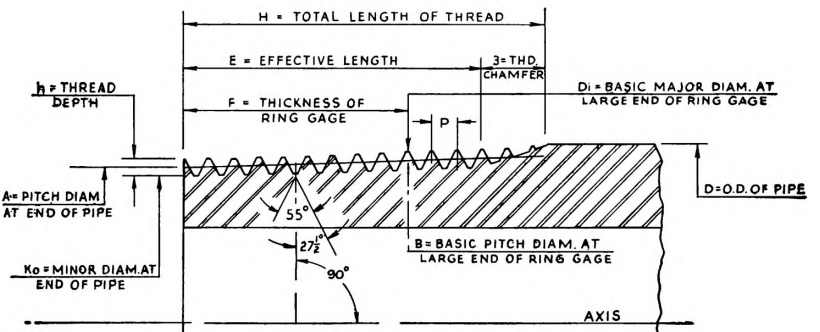
Threads per Inch		Depth Sharp V Thread Inches H	Truncation Inches		Equivalent Width of Flat Inches	
			Minimum	Maximum	Minimum	Maximum
27	Crest	.03208	.0017	.0035	.0020	.0040
	Root		.0035	.0052	.0040	.0060
18	Crest	.04811	.0026	.0043	.0030	.0050
	Root		.0043	.0061	.0050	.0070
14	Crest	.06186	.0026	.0043	.0030	.0050
	Root		.0043	.0061	.0050	.0070
11½	Crest	.07531	.0035	.0052	.0040	.0060
	Root		.0052	.0078	.0060	.0090
8	Crest	.10825	.0052	.0069	.0060	.0080
	Root		.0069	.0095	.0080	.0110

Note: The major diameter of std. ta. pipe plug gages and the minor diameter of std. ta. pipe ring gages used for gaging dryseal threads will be truncated .20p minimum or .25p maximum for all pitches.

TABLE 358

Basic Thread Dimensions and Tap Drill Sizes
British Standard Pipe Thread

Whitworth Form (American Tap Manufacturers' Practice)



Formula
- N = number of threads per inch
- $\frac{3}{4}$" taper per foot on diameter
- P = pitch
- Depth of pipe thread = .640327 P.

Note — A change in length of chamfer changes "H."

(See Table on following page)

TABLE 358

Basic Thread Dimensions and Tap Drill Sizes
British Standard Pipe Thread

Whitworth Form (American Tap Manufacturers' Practice)

(Concluded)

Pipe Size Nominal—Inches	Threads per Inch	Outside Diameter of Pipe (Mean)—Inches	Pitch Inches	Depth of Thread .6403 P—Inches	Basic Major Diam. at Large End of Ring Gage—Inches	Basic Pitch Diam. at Large End of Ring Gage—Inches	Pitch Diam. at End of Pipe—Inches	Minor Diam. at End of Pipe—Inches	Thickness of Ring Gage = Normal Engagement by Hand—Inches	Effective Length of Thread (Basic)—Inches	Total Length of Thread—Inches	Plus or Minus Tolerance on Length of Engagement		Tap Drill Sizes—Inches
												External Thread—Inches	Internal Thread—Inches	
	N	D	P	h	D^1	B	A	Ko	F	E	H			
1/8	28	.400	.03571	.0229	.383	.3601	.3503	.3274	.1563	.2545	.362	.0357	.0446	21/64
1/4	19	.538	.05263	.0337	.518	.4843	.4695	.4358	.2367	.3814	.539	.0526	.0658	29/64
3/8	19	.676	.05263	.0337	.656	.6223	.6067	.5730	.2500	.3947	.553	.0526	.0658	37/64
1/2	14	.847	.07143	.0457	.825	.7793	.7592	.7135	.3214	.5178	.732	.0714	.0893	23/32
3/4	14	1.063	.07143	.0457	1.041	.9953	.9719	.9262	.3750	.5714	.786	.0714	.0893	59/64
1	11	1.336	.09091	.0582	1.309	1.2508	1.2253	1.1671	.4091	.6591	.932	.0909	.1136	1 11/64
1 1/4	11	1.677	.09091	.0582	1.650	1.5918	1.5605	1.5023	.5000	.7500	1.023	.0909	.1136	1 1/2
1 1/2	11	1.909	.09091	.0582	1.882	1.8238	1.7925	1.7343	.5000	.7500	1.023	.0909	.1136	1 3/4
2	11	2.381	.09091	.0582	2.347	2.2888	2.2497	2.1915	.6250	.9204	1.193	.0909	.1136	2 7/32
2 1/2	11	2.996	.09091	.0582	2.960	2.9018	2.8588	2.8006	.6875	1.0511	1.324	.1364	.1364	2 13/16
3	11	3.499	.09091	.0582	3.460	3.4018	3.3510	3.2928	.8125	1.1761	1.449	.1364	.1364	3 5/16
3 1/2	11	3.991	.09091	.0582	3.950	3.8918	3.8371	3.7789	.8750	1.2386	1.511	.1364	.1364	3 13/16
4	11	4.494	.09091	.0582	4.450	4.3918	4.3293	4.2711	1.0000	1.4091	1.682	.1364	.1364	...
5	11	5.498	.09091	.0582	5.450	5.3918	5.3215	5.2633	1.1250	1.5795	1.852	.1364	.1364	...
6	11	6.501	.09091	.0582	6.450	6.3918	6.3215	6.2633	1.1250	1.5795	1.852	.1364	.1364	...
7	10	7.519	.10000	.0640	7.450	7.3860	7.3001	7.2361	1.3750	1.9250	2.225	.2000	.2000	...
8	10	8.524	.10000	.0640	8.450	8.3860	8.2922	8.2282	1.5000	2.0500	2.3500	.2000	.2000	...
9	10	9.529	.10000	.0640	9.450	9.3860	9.2922	9.2282	1.5000	2.0500	2.3500	.2000	.2000	...
10	10	10.534	.10000	.0640	10.450	10.3860	10.2844	10.2204	1.6250	2.1750	2.4750	.2000	.2000	...
11	8	11.540	.12500	.0800	11.450	11.3700	11.2684	11.1884	1.6250	2.3125	2.688	.2500	.2500	...
12	8	12.545	.12500	.0800	12.450	12.3700	12.2684	12.1884	1.6250	2.3125	2.688	.2500	.2500	...

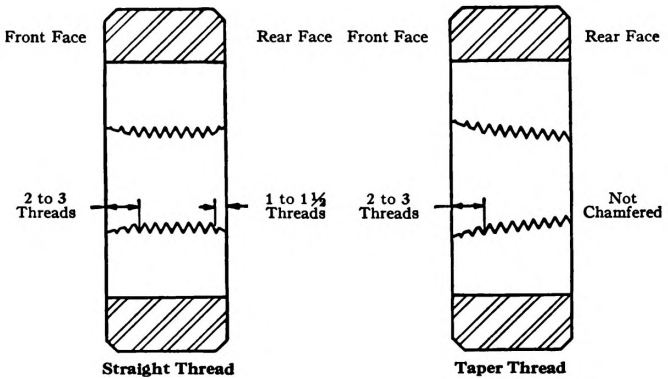
TABLE 360

Dies

Standard Chamfer

Regular dies as listed in this catalog will be chamfered approximately as shown in table below.

When dies are specified with a chamfer varying from that shown in the table, they will be considered special.



Type of Die	Approximate Number of Threads Chamfer	
	Front Face	Rear Face
Spring Screw Threading	2 to 3	.....
Solid Square Bolt	2 to 3	1 to 1½
Solid Square Pipe	2 to 3	0
Adjustable Round Split, Straight Thread	2 to 3	1 to 1½
Adjustable Round Split, Taper Thread	2 to 3	0
Hexagon Rethreading	1	1

TABLE 370

Constants for Finding Pitch Diameter and Root Diameter of Screw Threads

To find the pitch diameter or root diameter of any screw thread, subtract the constant for the number of threads per inch from the outside diameter.

Threads per Inch	Constants for Finding Pitch Diameter			Constants for Finding Root Diameter		
	National Thread	Whitworth Thread	Theoretical V	National Thread	Whitworth Thread	Theoretical V
72	.00902	.00889	.01203	.01804	.01786	.02406
64	.01015	.01000	.01353	.02030	.02001	.02706
60	.01083	.01067	.01443	.02165	.02134	.02887
56	.01160	.01144	.01546	.02320	.02286	.03093
50	.01299	.01281	.01732	.02598	.02562	.03464
48	.01353	.01334	.01804	.02706	.02668	.03608
44	.01476	.01455	.01968	.02952	.02910	.03936
40	.01624	.01601	.02165	.03248	.03202	.04330
36	.01804	.01779	.02406	.03608	.03558	.04811
32	.02030	.02001	.02706	.04059	.04002	.05413
30	.02165	.02134	.02887	.04330	.04268	.05773
28	.02320	.02287	.03093	.04639	.04574	.06186
27	.02406	.02372	.03207	.04812	.04742	.06416
26	.02498	.02463	.03331	.04996	.04926	.06662
24	.02706	.02668	.03608	.05413	.05336	.07217
22	.02952	.02911	.03936	.05905	.05821	.07873
20	.03248	.03202	.04330	.06495	.06403	.08660
18	.03608	.03557	.04811	.07217	.07114	.09623
16	.04059	.04002	.05413	.08119	.08004	.10825
14	.04639	.04574	.06186	.09279	.09147	.12372
13	.04996	.04926	.06662	.09993	.09851	.13323
12	.05413	.05336	.07217	.10825	.10672	.14434
11½	.05648	.05568	.07531	.11296	.11132	.15062
11	.05905	.05821	.07873	.11809	.11642	.15746
10	.06495	.06403	.08660	.12990	.12806	.17321
9	.07217	.07115	.09623	.14434	.14230	.19245
8	.08119	.08004	.10825	.16238	.16008	.21651
7	.09279	.09148	.12372	.18558	.18295	.24744
6	.10825	.10672	.14434	.21651	.21344	.28868
5½	.11809	.11642	.15746	.23619	.23284	.31492
5	.12990	.12807	.17321	.25981	.25613	.34641
4½	.14434	.14230	.19245	.28868	.28458	.38490
4	.16238	.16008	.21651	.32476	.32017	.43301
3½	.18558	.18295	.24744	.37115	.36590	.49487
3¼	.19985	.19702	.26647	.39970	.39404	.53294
3	.21651	.21344	.28868	.43301	.42689	.57733

TABLE 400

Comparative Chart

of Limiting Pitch Diameters for Gages

National Screw Thread Commission Standard

Machine Screw and Fractional Sizes

NOTE:—Limits shown in each column represent "Go" and "Not Go" sizes.

	SCREWS (RING THREAD GAGES)					NUTS (PLUG THREAD GAGES)			
Size	Loose Fit Class 1	Free Fit Class 2	Medium Fit Class 3	Close Fit Class 4	Basic P. D.	Loose Fit Class 1	Free Fit Class 2	Medium Fit Class 3	Close Fit Class 4
0–80	.0512 .0488	.0519 .0502	.0519 .0506	.0520 .0514	.0519	.0543 .0519	.0536 .0519	.0532 .0519	.0525 .0519
1–72	.0633 .0608	.0640 .0622	.0640 .0627	.0641 .0634	.0640	.0665 .0640	.0658 .0640	.0653 .0640	.0647 .0640
1–64	.0622 .0596	.0629 .0610	.0629 .0615	.0630 .0623	.0629	.0655 .0629	.0648 .0629	.0643 .0629	.0636 .0629
2–64	.0752 .0726	.0759 .0740	.0759 .0745	.0760 .0753	.0759	.0785 .0759	.0778 .0759	.0773 .0759	.0766 .0759
2–56	.0736 .0708	.0744 .0724	.0744 .0729	.0746 .0739	.0744	.0772 .0744	.0764 .0744	.0759 .0744	.0751 .0744
3–56	.0866 .0838	.0874 .0854	.0874 .0859	.0876 .0869	.0874	.0902 .0874	.0894 .0874	.0889 .0874	.0881 .0874
3–48	.0846 .0815	.0855 .0833	.0855 .0839	.0857 .0849	.0855	.0886 .0855	.0877 .0855	.0871 .0855	.0863 .0855
4–48	.0976 .0945	.0985 .0963	.0985 .0969	.0987 .0979	.0985	.1016 .0985	.1007 .0985	.1001 .0985	.0993 .0985
4–40	.0948 .0914	.0958 .0934	.0958 .0941	.0960 .0951	.0958	.0992 .0958	.0982 .0958	.0975 .0958	.0967 .0958
5–44	.1093 .1061	.1102 .1079	.1102 .1086	.1104 .1096	.1102	.1134 .1102	.1125 .1102	.1118 .1102	.1110 .1102
5–40	.1078 .1044	.1088 .1064	.1088 .1071	.1090 .1081	.1088	.1122 .1088	.1112 .1088	.1105 .1088	.1097 .1088
6–40	.1208 .1174	.1218 .1194	.1218 .1201	.1220 .1211	.1218	.1252 .1218	.1242 .1218	.1235 .1218	.1227 .1218
6–32	.1166 .1128	.1177 .1150	.1177 .1158	.1179 .1169	.1177	.1215 .1177	.1204 .1177	.1196 .1177	.1187 .1177
8–36	.1449 .1413	.1460 .1435	.1460 .1442	.1462 .1453	.1460	.1496 .1460	.1485 .1460	.1478 .1460	.1469 .1460
8–32	.1426 .1388	.1437 .1410	.1437 .1418	.1439 .1429	.1437	.1475 .1437	.1464 .1437	.1456 .1437	.1447 .1437
10–32	.1686 .1648	.1697 .1670	.1697 .1678	.1699 .1689	.1697	.1735 .1697	.1724 .1697	.1716 .1697	.1707 .1697
10–24	.1616 .1570	.1629 .1596	.1629 .1605	.1632 .1620	.1629	.1675 .1629	.1662 .1629	.1653 .1629	.1641 .1629
12–28	.1916 .1873	.1928 .1897	.1928 .1906	.1930 .1919	.1928	.1971 .1928	.1959 .1928	.1950 .1928	.1939 .1928
12–24	.1876 .1830	.1889 .1856	.1889 .1865	.1892 .1880	.1889	.1935 .1889	.1922 .1889	.1913 .1889	.1901 .1889
¼–28	.2256 .2213	.2268 .2237	.2268 .2246	.2270 .2259	.2268	.2311 .2268	.2299 .2268	.2290 .2268	.2279 .2268
¼–20	.2160 .2109	.2175 .2139	.2175 .2149	.2178 .2165	.2175	.2226 .2175	.2211 .2175	.2201 .2175	.2188 .2175
5/16–24	.2841 .2795	.2854 .2821	.2854 .2830	.2857 .2845	.2854	.2900 .2854	.2887 .2854	.2878 .2854	.2866 .2854
5/16–18	.2748 .2691	.2764 .2723	.2764 .2734	.2767 .2752	.2764	.2821 .2764	.2805 .2764	.2794 .2764	.2779 .2764

TABLE 400

Comparative Chart

of Limiting Pitch Diameters for Gages

National Screw Thread Commission Standard

Fractional Sizes

NOTE:—Limits shown in each column represent "Go" and "Not Go" gage sizes.

SCREWS (RING THREAD GAGES)					NUTS (PLUG THREAD GAGES)				
Size	Loose Fit Class 1	Free Fit Class 2	Medium Fit Class 3	Close Fit Class 4	Basic P. D.	Loose Fit Class 1	Free Fit Class 2	Medium Fit Class 3	Close Fit Class 4
5/8–24	.3466 .3420	.3479 .3446	.3479 .3455	.3482 .3470	.3479	.3525 .3479	.3512 .3479	.3503 .3479	.3491 .3479
3/8–16	.3326 .3263	.3344 .3299	.3344 .3312	.3348 .3332	.3344	.3407 .3344	.3389 .3344	.3376 .3344	.3360 .3344
7/16–20	.4035 .3984	.4050 .4014	.4050 .4024	.4053 .4040	.4050	.4101 .4050	.4086 .4050	.4076 .4050	.4063 .4050
7/16–14	.3890 .3820	.3911 .3862	.3911 .3875	.3915 .3897	.3911	.3981 .3911	.3960 .3911	.3947 .3911	.3929 .3911
1/2–20	.4660 .4609	.4675 .4639	.4675 .4649	.4678 .4665	.4675	.4726 .4675	.4711 .4675	.4701 .4675	.4688 .4675
1/2–13	.4478 .4404	.4500 .4448	.4500 .4463	.4504 .4485	.4500	.4574 .4500	.4552 .4500	.4537 .4500	.4519 .4500
9/16–18	.5248 .5191	.5264 .5223	.5264 .5234	.5267 .5252	.5264	.5321 .5264	.5305 .5264	.5294 .5264	.5279 .5264
9/16–12	.5060 .4981	.5084 .5028	.5084 .5044	.5089 .5069	.5084	.5163 .5084	.5140 .5084	.5124 .5084	.5104 .5084
5/8–18	.5873 .5816	.5889 .5848	.5889 .5859	.5892 .5877	.5889	.5946 .5889	.5930 .5889	.5919 .5889	.5904 .5889
5/8–11	.5634 .5549	.5660 .5601	.5660 .5618	.5665 .5644	.5660	.5745 .5660	.5719 .5660	.5702 .5660	.5681 .5660
3/4–16	.7076 .7013	.7094 .7049	.7094 .7062	.7098 .7082	.7094	.7157 .7094	.7139 .7094	.7126 .7094	.7110 .7094
3/4–10	.6822 .6730	.6850 .6786	.6850 .6805	.6856 .6833	.6850	.6942 .6850	.6914 .6850	.6895 .6850	.6873 .6850
7/8–14	.8265 .8195	.8286 .8237	.8286 .8250	.8290 .8272	.8286	.8356 .8286	.8335 .8286	.8322 .8286	.8304 .8286
7/8– 9	.7997 .7897	.8028 .7958	.8028 .7979	.8034 .8010	.8028	.8128 .8028	.8098 .8028	.8077 .8028	.8052 .8028
1 –14	.9515 .9445	.9536 .9487	.9536 .9500	.9540 .9522	.9536	.9606 .9536	.9585 .9536	.9572 .9536	.9554 .9536
1 – 8	.9154 .9043	.9188 .9112	.9188 .9134	.9195 .9168	.9188	.9299 .9188	.9264 .9188	.9242 .9188	.9215 .9188
1 1/8–12	1.0685 1.0606	1.0709 1.0653	1.0709 1.0669	1.0714 1.0694	1.0709	1.0788 1.0709	1.0765 1.0709	1.0749 1.0709	1.0729 1.0709
1 1/8– 7	1.0283 1.0159	1.0322 1.0237	1.0322 1.0263	1.0330 1.0300	1.0322	1.0446 1.0322	1.0407 1.0322	1.0381 1.0322	1.0352 1.0322
1 1/4–12	1.1935 1.1856	1.1959 1.1903	1.1959 1.1919	1.1964 1.1944	1.1959	1.2038 1.1959	1.2015 1.1959	1.1999 1.1959	1.1979 1.1959
1 1/4– 7	1.1533 1.1409	1.1572 1.1487	1.1572 1.1513	1.1580 1.1550	1.1572	1.1696 1.1572	1.1657 1.1572	1.1631 1.1572	1.1602 1.1572
1 1/2–12	1.4435 1.4356	1.4459 1.4403	1.4459 1.4419	1.4464 1.4444	1.4459	1.4538 1.4459	1.4515 1.4459	1.4499 1.4459	1.4479 1.4459
1 1/2– 6	1.3873 1.3728	1.3917 1.3816	1.3917 1.3846	1.3926 1.3890	1.3917	1.4062 1.3917	1.4018 1.3917	1.3988 1.3917	1.3953 1.3917

Hardness Conversion Table

FOR STRUCTURAL ALLOY STEELS

(Approximate)

Rockwell		Brinell	Shore	Rockwell		Brinell	Shore
C Scale 150 kg. 120° Diamond Cone	B Scale 100 kg. 1/16" Ball			C Scale 150 kg. 120° Diamond Cone	B Scale 100 kg. 1/16" Ball		
68		780	96	32		311	43
67		745	94	31		302	42
65		712	92	30		293	41
63		682	89	29		285	40
62		653	86	28		277	38
60		627	84	27	...	269	37
58		601	81	26	...	262	36
56		578	78	25	...	255	35
55		555	75	24	100	248	34
53		534	73	23	99	241	33
51		514	71	22	99	235	32
50		495	68	21	98	229	32
48		477	66	20	97	223	31
47		461	64	18	96	217	30
46		444	62	17	95	212	30
44		429	60	16	95	207	29
43		415	58	14	93	197	28
42		401	56	12	91	187	27
41		388	54	10	89	179	25
39		375	52	8	87	170	24
38	...	363	51	6	85	163	23
37	...	352	49	4	83	156	23
36	...	341	48	2	81	149	22
35	...	331	46	0	79	143	21
34	...	321	45	−3	77	137	20

Data compiled by Research Lab., Development and Research Dept., The International Nickel Company, Inc., 67 Wall St., New York, N. Y.

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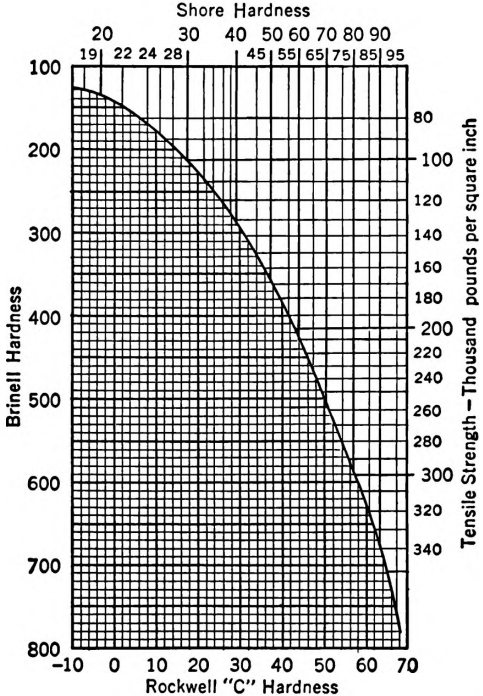
Hardness Conversion Table—continued

Approximate Relations between Brinell, Rockwell and Shore Hardnesses and the Tensile Strengths of Structural Alloy Steels



Conversions from one scale to another are made at the intercepts with the curve crossing the chart. For example, follow the horizontal line representing 200 Brinell hardness to its intersection with the conversion curve. From this point follow vertically upward for equivalent Shore hardness values (28), vertically downward for Rockwell C values (14+), and horizontally to the right for the tensile strength (96,000).

By courtesy of The International Nickel Company, Inc.

TABLE 401

Of Decimals

Equalling Parts of an Inch

1/64	.0156	33/64	.5156
1/32	.0313	17/32	.5313
3/64	.0469	35/64	.5469
1–16	.0625	9–16	.5625
5/64	.0781	37/64	.5781
3/32	.0938	19/32	.5938
7/64	1094	39/64	.6094
1–8	.1250	5–8	.6250
9/64	.1406	41/64	.6406
5/32	.1563	21/32	.6563
11/64	.1719	43/64	.6719
3–16	.1875	11–16	.6875
13/64	.2031	45/64	.7031
7/32	.2188	23/32	.7188
15/64	.2344	47/64	.7344
1–4	.2500	3–4	.7500
17/64	.2656	49/64	.7656
9/32	.2813	25/32	.7813
19/64	.2969	51/64	.7969
5–16	.3125	13–16	.8125
21/64	.3281	53/64	.8281
11/32	.3438	27/32	.8438
23/64	.3594	55/64	.8594
3–8	.3750	7–8	.8750
25/64	.3906	57/64	.8906
13/32	.4063	29/32	.9063
27/64	.4219	59/64	.9219
7–16	.4375	15–16	.9375
29/64	.4531	61/64	.9531
15/32	.4688	31/32	.9688
31/64	.4844	63/64	.9844
1–2	.5000	1	1.

TABLE 402

Weight per Inch

Of round bars of carbon and high speed steel in pounds per linear inch.

Diam. of Bar Inches	Weight of Bar One Inch Long		Diam. of Bar Inches	Weight of Bar One Inch Long		Diam. of Bar Inches	Weight of Bar One Inch Long	
	Carbon Steel	High Speed Steel		Carbon Steel	High Speed Steel		Carbon Steel	High Speed Steel
1/16	.00087	.00098	2 7/16	1.33	1.496	4 13/16	5.15	5.793
1/8	.0035	.0039	2 1/2	1.39	1.563	4 7/8	5.28	5.940
3/16	.0078	.0088	2 9/16	1.46	1.642	4 15/16	5.42	6.097
1/4	.0139	.0156	2 5/8	1.53	1.721	5	5.56	6.255
5/16	.0217	.0244	2 11/16	1.61	1.811	5 1/16	5.70	6.412
3/8	.0313	.0352	2 3/4	1.68	1.890	5 1/8	5.84	6.570
7/16	.0425	.0478	2 13/16	1.76	1.980	5 3/16	5.98	6.727
1/2	.0556	.0625	2 7/8	1.84	2.070	5 1/4	6.13	6.896
9/16	.0703	.0791	2 15/16	1.92	2.160	5 5/16	6.27	7.053
5/8	.0868	.0976	3	2.00	2.250	5 3/8	6.42	7.222
11/16	.105	.118	3 1/16	2.08	2.340	5 7/16	6.57	7.391
3/4	.125	.141	3 1/8	2.17	2.441	5 1/2	6.72	7.560
13/16	.147	.165	3 3/16	2.26	2.542	5 9/16	6.88	7.740
7/8	.170	.191	3 1/4	2.35	2.643	5 5/8	7.03	7.908
15/16	.195	.219	3 5/16	2.44	2.745	5 11/16	7.19	8.088
1	.22	.248	3 3/8	2.53	2.846	5 3/4	7.35	8.268
1 1/16	.25	.281	3 7/16	2.63	2.958	5 13/16	7.51	8.448
1 1/8	.28	.315	3 1/2	2.72	3.060	5 7/8	7.67	8.628
1 3/16	.31	.349	3 9/16	2.82	3.172	5 15/16	7.84	8.820
1 1/4	.35	.397	3 5/8	2.92	3.285	6	8.00	9.000
1 5/16	.38	.427	3 11/16	3.02	3.397	6 1/8	8.34	9.382
1 3/8	.42	.472	3 3/4	3.13	3.521	6 1/4	8.68	9.765
1 7/16	.46	.517	3 13/16	3.23	3.633	6 3/8	9.03	10.16
1 1/2	.50	.562	3 7/8	3.34	3.757	6 1/2	9.39	10.56
1 9/16	.54	.607	3 15/16	3.45	3.881	6 5/8	9.76	10.98
1 5/8	.59	.663	4	3.56	4.005	6 3/4	10.1	11.36
1 11/16	.63	.709	4 1/16	3.67	4.128	6 7/8	10.5	11.81
1 3/4	.68	.765	4 1/8	3.78	4.252	7	10.9	12.26
1 13/16	.73	.821	4 3/16	3.90	4.387	7 1/8	11.3	12.71
1 7/8	.78	.877	4 1/4	4.01	4.511	7 1/4	11.7	13.16
1 15/16	.83	.933	4 5/16	4.13	4.646	7 3/8	12.1	13.61
2	.89	1.001	4 3/8	4.25	4.781	7 1/2	12.5	14.06
2 1/16	.94	1.057	4 7/16	4.38	4.927	7 5/8	12.9	14.51
2 1/8	1.00	1.125	4 1/2	4.50	5.062	7 3/4	13.3	14.96
2 3/16	1.06	1.192	4 9/16	4.63	5.208	7 7/8	13.8	15.52
2 1/4	1.13	1.271	4 5/8	4.75	5.343	8	14.3	16.08
2 5/16	1.19	1.338	4 11/16	4.88	5.490			
2 3/8	1.25	1.406	4 3/4	5.01	5.636			

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